Subterranea

January 2003 Issue 1

In This Issue

The Maginot Line in the Alps - Trip Report and Photos

Sub Brit 2002 French Trip

Books, News and Reviews

Sub Brit Clothing Now Available See Inside

A new section is now online at www.subbrit.org.uk covering non coldwar sites

The Newsletter of Subterrranea Britannica and The Cold War Research Study Group.
www.subbrit.org.uk

Subterranea Britannica is a society devoted to the study of man-made and man-used, underground structures and the archaeology of the Cold War. The main focus of interest is on abandoned and forgotten structures and, in the case of Cold War structures, studies are entirely confined to declassified and decommissioned structures.
The society is open to all and its membership includes all walks of life. Members are invited to contribute to this newsletter even if this just means sending very welcome snippets from newspapers and magazines.

Editor

Dan McKenzie
Please send contributions to;

Dan McKenzie, 53 Home Pasture, Werrington, Peterborough, PE4 5AY
E-mail dan.mckenzie@bunkertours.com

Welcome to this the first edition of "Subterranea" the newsletter of Subterranea Britannica and the Cold War Research Study Group (RSG), I have taken over as the official editor of our new publication, from Malcolm Tadd, who has done a sterling job for many years, "many thanks Malcolm". I now need you to send me your snippets of news, book reviews and articles on a Subterranean or Cold war theme.

In this issue you will find, an articles on the recent Sub Brit visits to Holton Heath, The Maginot Line in the South of France. There are also flyers with invitations to the Sub Brit RSG study day at Hack Green Nuclear Bunker and also information on the annual "Martin and Linda's Sub Brit French Trip" which I believe is going to Belgium this year!
Also In this Issue is your Chance to get Kitted out in Sub Brit Clothing, Thanks to John Burgess for arranging this, You can see and order the full range on page 16.

Dan McKenzie

Cover Photograph: Maginot Line - GO Flaut Intermediate level corridor. (Dan McKenzie)
Back Page: 1. Maginot Line - GO Flaut (Dan McKenzie) 2. Maginot Line - GO Plan Caval Block 4(Nick Catford) 3. Maginot Line - GO Plan Caval, Unfinished Gallery (Nick Catford) 4.Maginot Line - GO Mont Gros (Dan McKenzie)

News

SECRET CHAMBERS DISCOVERED UNDER BRIDGE

Hidden chambers have been discovered beneath a Clifton Suspension Bridge tower in Bristol. The 12 chambers were found by climbers and cavers in the south tower's man- made stone support.

With huge vaulted ceilings and 4m stalactites, the chambers can only be reached by experts.

A bore-hole was sunk into the stone in 1969, but when it missed the chambers it was presumed the stone was solid.

From: P118 CEEFAX 1 118 Wed 06 Nov 14:47/42

WAWNE

A piece of Wawne's Cold War history will be brought back to life on Remembrance Sunday. The Wawne Bunker Trust said it is on schedule to open the 1950s shelter, built to withstand a nuclear bomb attack, on November 10.

Dave Skinner, a spokesman for the Trust, said the bunker is the last remaining example from the Cold War in the UK and will be a vital educational tool for schools and colleges.

The opening of the bunker follows months of battling to save it, after East Riding Council earmarked the site, off Meaux Road, for housing.

However, Lakeland Developments was praised by Mr Skinner after it handed over the keys to the bunker before giving the Trust a 100-year lease for a peppercorn rent of £1 per year.

Mr Skinner said: "We're really looking forward to the opening. "The bunker will be a major resource for schools and colleges as well as hundreds of visitors."

Anyone who wants to get involved with the Trust's project of refurbishing the bunker should call Reg Bird on (01482) 822828.

From: The Hull Daily Mail.

BOX TUNNEL

A live grenade was found in the Box Tunnel near Corsham, Wiltshire on Wednesday 2nd October 2002. It is believed to be a US army issue grenade from World War II. The tunnel was closed in both directions causing the cancellation of services between Bath and Chippenham. The workers who found the grenade were felling trees near the tunnel entrance.

LOST VILLAGE

There are many rumours about the existence of a lost village beneath the platforms of Glasgow's Central Station. Some say that streets remain perfectly preserved below what is now the ground level, and other say there is little more than rats, refuse or even ghosts. However, the truth is slightly stranger.

Norrie Gilliland, the author of The Grahamston Story says, "Grahamston was first noted on the maps of Glasgow in the 1680s. It was just a row of cottages along Argyle Street. It grew up till the 1870s into a very important commercial centre, probably about 2000 people living here and 300 businesses"

The village grew in population and prosperity due to its central location for trade. By the 1800s it was busy, bustling area, but its location became its downfall. By 1871 the first phase of demolition started - to make way for Caledonian Railways' Central Station.

Norrie Gilliland said: "Grahamston was part of the growth of Glasgow. It wasn't some far flung destination, but rather it stood at the crossroads - the main axis north and south, east and west. It's legacy really is the growth of Glasgow."

Now, deep below Central Station lies a maze of tunnels, much of the legacy of Grahamston. Norrie Gilliland said: "People think if you dig down under Grahamston you will find the remains, but its really all been hidden behind the arches."

From:Scotland Today

MUSSOLINI BUNKER

A Secret underground bunker used by Mussolini has been rediscovered beneath a grandiose Fascist complex. The air raid shelter was found by workers restoring buildings in southwest Rome that were built in the 1930s for an exhibition, the "Esposizione Universale di Roma".

The wartime bunker is made of reinforced concrete, with walls 40cm (15.75in) thick. All the furniture has gone, but it still contains two "bicycles" attached to dynamos to generate electricity if the main supply were cut off.

A metal plaque on the wall bears the inscription "President of the Council of Ministers", Mussolini's title as Prime Minister, with other notices instructing the occupants to observe "silence and calm" and not to smoke. There is also a gun rack, now empty, and

News

two 6ft-high bronze busts of Il Duce.

The international exhibition, which Mussolini had planned for 1942 to advertise the "Progress of Civilisation" under Fascism, was never held because of the war.

The vast area of broad boulevards, landscaped parks and buildings invoking the grandeur of Ancient Rome was damaged during the war and for a while lay derelict. It has now been revived as a residential and business district, with many buildings, acknowledged masterpieces of Fascist architecture, turned into offices and sports or entertainment complexes.

The 470-metre-square underground shelter came to light beneath the Palazzo degli Uffici (Palace of Offices), the main Fascist administration block, built in 1937-39. Francesco Innamorati, the architect in charge of its restoration, said that it lay 8 metres deep and was reached through a maze of corridors and metal doors leading to a flight of stairs.

The entrance, untouched for more than half a century, consisted of a steel security door beyond which were rubber-sealed inner doors to prevent possible gas infiltration.

"Every time you clean something up in Rome an unknown piece of history re-emerges," said La Repubblica, for whom the bunker highlighted the contrast between the "triumphalism" of the Fascist architecture above and "the reality of conflict below, with the dictator having to hide from bombs or the threat of bombs".

From: The Times 25.10.2002

WILDLIFE THRIVES AT COLD WAR BUNKER

Work to protect valuable heathland wildlife is starting at a former nuclear bunker in East Sussex.

Sussex Police's training facility at Kingstanding, near Crowborough, has been designated a European Special Area of Conservation. The force is now obliged to maintain the site, formerly a military establishment, for wildlife.

Steve Wheatley, who is involved with the conservation project, said: "Work over the next three years will involve reintroducing grazing animals and the existing high fencing will help enormously.

"Initially we plan to use cattle but later it may prove more appropriate to use ponies or even feral goats.

"Work is also required to remove trees and gorse encroaching on the heathland, open up areas and create bare ground, which is an essential heathland component for some species."
Controlled burning will take place on the 60-acre site in order to promote the growth of heather.

The project will be funded by English Nature and the Weald Heathland Initiative.

From: http://www.thisisbrighton.co.uk

HELP SUBTERRANEA BRITANNICA!

We are looking for a volunteer to take over the duties of Treasurer with effect from the next AGM, when our current treasurer Gerald Tagg will be stepping down after twelve years in the post.

You'll need to have some spare time, a head for figures, and be prepared to attend Committee meetings approximately three or four times a year.

If this sounds like you, then please contact Gerald Tagg in the first instance to discuss details.

From: The Committee

MINING MONUMENTS IN LOWER SILESIA

There is a new brochure for English-speaking tourists interested in industrial archaeology in Poland, produced by the Lower Silesia Tourist Organisation. Their web site is www.nto-poland.gov.pl

The guide has information on the following publicly-accessible sites :

Zl·oty Stok Gold mines worked from the 13th century onwards - an estimated 16 tonnes of gold having been recovered - later worked for arsenic - mining ceased in 1962 - now a publicly visitable show-mine, with two underground adits (including 16th C) accessible, displays, etc

Museum of mining - tourist underground coal mine in **Nowa Ruda** which Includes 700m of publicly accessible mine galleries, exhibits, etc

Wal·brzych Museum of Industry and Technology Includes 500 year old coal mines - parts of the shafts and galleries are open to the public - the 19th century surface industrial complex includes pitheads and machinery displays - the underground tour is c. 1 kilometre

News

Kowary underground galleries Publicly visitable industrial / mining site including a1200m underground section - mining from the 12th century onwards for magnetite -the area was famous for arms and armour manufacture - post-World War II uranium was mined here - there was also a radium (radon) inhalation sanatorium!

Zł·otoryja "Aurelia Mine" [Includes a 100m underground visit - gold was mined from placer deposits and from gold-bearing dolerite by underground mining - also copper, iron, and barytes

The Museum of the **Walim** Underground Galleries An unfinished German WWII complex of six underground sites of unknown purpose (possible underground experimental or production factories or a Hitler's intended headquarters) - the sites were never linked underground as (it seems) intended - within Sowie (Owl) Mountain, and code-named Riese (giant)

Mysterious Underground City - underground tourist tours in the **Osówska** Complex One of the underground sections of Riese (see above) near **Gł·uszyca**

Mineralogical Museum, **Szklarska Poręba** Surface museum only

The guide was written by J. BOGDAŃSKI, Z. ŁAZANOWSKI, B. ROSICKI, and I. RYGIELSKA

From Paul W.Sowan

RELIVING BRUNELS' WONDER OF THE WORLD

museum in disused shaft may cast light on great British engineering dynasty's feat in building the first road tunnel under a river.

The Brunel Engine House Trust has for some years maintained a display concerning the construction of the Thames Tunnel, by Marc and Isambard Kingdom Brunel, in their former engine house beside the south bank shaft at Rotherhithe. They now propose to extend their publicly accessible displays into the Brunels' shaft.

The tunnel, constructed with great difficulty 1824 - 42 (there were collapses and flooding on several occasions), had been intended to be a road tunnel to take horse-drawn road traffic. However, as a result of a shortfall in funding, the roadway access ramps at each end were never made, and until the 1860s this was only a pedestrian tunnel. In that year it was purchased by the East London Railway and has,

since then, been used (and continues in use) as a railway tunnel.

The shaft, dug as a spoil extraction and ventilation shaft in or about 1824, is now of no functional railway use (the railway has long since been electrified), and is seen by the Trust as an opportunity to expand their visitor attraction.

The Guardian, 29 July 2002, page 24.

WINSTON WAR BUNKER OPENS ITS DOORS

A subterranean suite of rooms used by Winston Churchill and his closest wartime advisers is to be opened to the public next year.
After decades serving as, among other things, Treasury storerooms and a hall used by its aikido club, the network of offices under King Charles Street, between Downing Street and the Houses of Parliament, is being restored as part of a £7 million refurbishment.
They will form an extension to the existing Cabinet War Rooms and are due to be unveiled in the spring.
Greatest interest is likely to centre on the bedroom provided for Mrs Churchill, along with an underground dining room and kitchen for the Prime Minister and his wife. Other attractions include a hall used by the Chiefs of Staff and a corridor of sparsely-furnished billets.
At first glance they look like prison cells but their inhabitants included two of Churchill's parliamentary private secretaries, Sir George Harvie-Watt and Brendan Bracken, who later became Minister of Information.
The "Churchill Suite" will receive its first visitors next spring.
The storerooms have provided a treasure trove of metallic green filing cabinets, standard issue tables and rows of coat-hooks. But the highlight is a wooden correspondence rack complete with pigeon holes for, among others, the King and the Chancellor of the Exchequer.
The rooms are being restored with the aid of pictures taken of the nerve centre during or after the war.
It is known that 115 cabinet meetings were held in the deepest bowels of Whitehall and probably twice as many of the Defence Committee in the maze 10 feet underneath Whitehall.
How often Sir Winston and his wife used the sleeping accommodation remains unclear.

From: The Times 26/12/2002

Books

'With Britain in Mortal Danger'

Edited by John Warwicker

Published by Cerberus Books (ISBN 1 84145 112 6)

This new book tells the story of the most secret GHQ Auxiliary Units of WW2. Consisting of 320 pages and about 100 photographs it will be on sale from mid November in all good bookshops at £20.

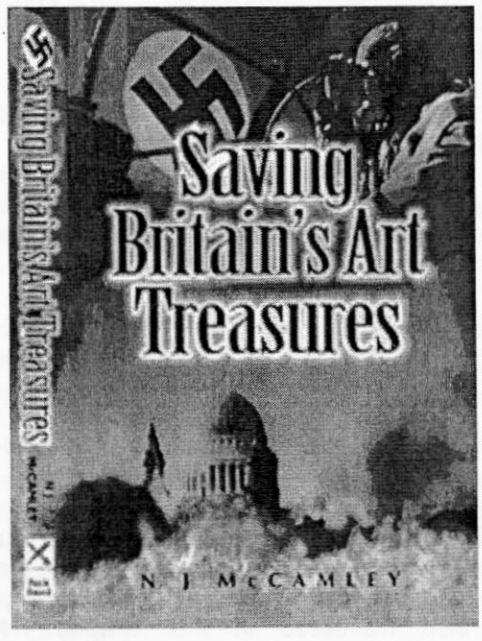
A limited number of signed copies at a discounted price of £15 (including P & P) will be available during the first week of December and may be ordered directly in advance. Send a cheque for £15 payable to Ann Warwicker to 3 Pound Farm Cottages, Great Glemham, Saxmundham, Suffolk, IP17 2DQ.

All proceeds go to the Museum of the British Resistance Organisation

'Saving Britain's Art Treasures'

Nick McCamley

Published by Pen & Sword , ISBN: 0850529182



INTRODUCTION

A broad overview of the chapters that follow

INTER-WAR PLANS
Provisions made for safety of the treasures in WW1 (use of uncompleted GPO underground railway stations, Aldwych tube, South Kensington subway, cellars of museums and galleries etc).

Plans prepared in 1934 to evacuate London completely as it was felt to be too vulnerable to German bombers. At first large country houses in Wales and the outer fringes of the Home Counties considered safe enough.

Tube tunnels earmarked for use in WW2 but plans are thrown into disarray following altercations between the Treasury, the Museums ARP committee and the War Office who are already squatting in Brompton Road station.

Treasury absolutely opposed to any form of underground repositories but is manoeuvred into financing a tunnel system in the grounds of the National Library of Wales at Aberystwyth for the safe-keeping of the Welsh National treasures. This development , eventually, is used by the London museums and galleries as a lever to force open the Treasury coffers to finance their own underground stores.

THE COUNTRY HOUSE REPOSITORIES

The National Register of country houses suitable for use as arts repositories is secretly prepared in 1934. As news leaks out, hundreds of owners of lesser houses flood the authorities with offers of their own properties ... in order to safeguard themselves from the risk of having working-class evacuee children billeted upon them in wartime. This becomes a major national scandal.

1939... houses are occupied by the museums and galleries but within months the situation becomes untenable. Conditions in most are dreadful; the owners, who initially offered their properties free of charge as an act of patriotism begin a concerted campaign to demand rent from the authorities and become generally fractious.

By mid-1940 other problems develop: the fall of France leaves Germany in control of airfields in northern France and thus able to range freely over the whole of Britain. All the country houses are suddenly vulnerable. On top of that the government perceives an immediate risk to the collections housed in properties in north and west Wales to the depredations of Welsh and Irish Nationalist terrorist gangs.

THE BRITISH MUSEUM
Initially, the very heavy Egyptian and Assyrian statuary, the Elgin Marbles, etc, are transported on the eve of war (by means of a scheduled ballast train from the LPTB Lillie Bridge depot) to the Aldwych tube. Other material is evacuated to Boughton House and Drayton House in Northamptonshire.

Both houses are soon declared too vulnerable, and

Books

there is trouble brewing about the use of Aldwych as a repository for 'elitist trifles' when it could be better used as a public air raid shelter.

Pressure is building up for the development of an underground bolt-hole, and eventually, after other sites including a 400 foot deep salt mine in Cheshire are investigated, Westwood Quarry is located and accepted.

VICTORIA & ALBERT MUSEUM
At the outbreak of war some artefacts are removed to a purpose-built basement bunker in Kensington but the majority of the museums contents are removed to Montacute House in Somerset.

Something of a scandal regarding 'Brats from Bristol'.

Montacute becomes untenable so an underground repository is sought.

WESTWOOD QUARRY
Pressure from Churchill, Beaverbrook and the Archbishop of Canterbury (amongst others) eventually forces the Treasury into developing Westwood Quarry as a joint repository for the V&A and the British Museum.

Most of the quarry is already in use as an underground factory, and the first part of this chapter gives an overview of this development and the Corsham underground factory project as a whole.

The bulk of the chapter deals with the construction of the repository, the transfer of artefacts and the difficult job of maintaining adequate environmental conditions underground.

Another minor scandal: the authorities are mislead over the condition of a standby generator acquired for the museum repository. This machine explodes on the first occasion that it is run.

Inadequacies of the air-conditioning plant exposed,

NATIONAL GALLERY
Pictures first evacuated to houses in Gloucestershire and North Wale, the majority going to Penrhyn Castle.

Lord Penrhyn becomes most obstructive... National Gallery staff at the castle describe him as a 'drunken philistine'. His obstructiveness, coupled with the actions of the Welsh Nationalists and the vulnerability of the castle following the fall of France (the huge expanse of roof on Penrhyn Castle is used by German pilots as a beacon while navigating to bomb the docks at Liverpool) makes the development of a more secure underground repository inevitable.

Manod slate quarry is found, and plans are laid for its development.

Harsh conditions, its remote location and terrible weather retard development.

The job is eventually finished, but problems arise with the transfer of the paintings. 'King Charles 1st on Horseback' (the largest picture in the NG collection) will not pass under the Ffestiniog railway bridge.

Roof collapses within the quarry cast doubt over the continued use of the quarry, but these difficulties are overcome and Manod is retained until the end of the war and for decades beyond.

TATE, WALLACE AND THE IMPERIAL WAR MUSEUM
Mainly evacuated to country houses in Cumberland, Herefordshire and Worcestershire, including 'Hellens" the home of the formidable Lady Helena Gleichen (grand niece of Queen Victoria), and Eastington Hall in Worcestershire, the property of the scandalous Mademoiselle Montegeon.

The Wallace Collection is evacuated to Balls Park and Hall Barn in a fleet of coal lorries.

PROVINCIAL GALLERIES AND THE ECCLESIASTICAL TREASURES
Amongst many other subjects, this chapter deals with the use of Shepton Mallet Prison in Somerset as the secret hideaway for the most iconic artefacts from the Public Records Office.

CONCLUSION – WW3
The return to London in 1945, and plans prepared for WW3

Sir William Akers declares Manod Quarry the ideal radiation-proof store for use in an atomic war.

London Tube tunnels are also considered as atom-bomb-proof repositories, but most are already earmarked for the Home Office. The tube flood-gate plan is also discussed in this chapter. New generators, etc, are installed in Westwood and Manod in the 1960's, and a series of evacuation exercises are conducted by the National Galleries in 1958, 1963 and 1978.
'Operation Methodical' the last cold-war arts evacuation plan

Illustrated with approximately 80 photographs (most never seen before) and five plans

Books

'Box Freestone Mines'

By the Cotham Caving Group

Third Edition, revised and updated 2002.

iv + 67 pp, 4 pp maps, 7 colour plates on 4 pp [=total 79 pp], 17 B&W photos in text.

A5 SB price £7.95 + £1.00 p&p

The first edition was published in 1967 and if I remember correctly is was a quarto sized publication, run off on an old Gestetner duplicator. Interest in these mines is still as keen as ever, hence this new glossy publication.

Since 1967 the mines have seen many changes, as mining became uneconomic many quarrying firms ceased production and only three companies are still working today.

The end of the cold war sounded the end of the great underground weapons store at Box and this closed in the 1990's. Likewise, many of the entrances have been filled in and today only the entrance to Jack's Workings is left. The Backdoor is officially closed.

Bath stone or Oolite is quite soft when first cut, but after being allowed to dry out, it turns into hard building stone.

It has been used in the construction of such edifices as the Georgian Crescent in Bath and the Houses of Parliament in London. The removal of the stone has left a maze of passages over 35 miles long.

In 1959, teenage cavers, from Cotham Grammar School, Bristol, rediscovered the old Box workings. Exited by what they found, they began to spend their weekends exploring and map making.

Travelling to and fro by bus, they often camped underground to gain extra time for the work. The major routes were surveyed, measured and recorded in scrupulous detail. The only omission I could find was that they did not identify the original explorer of the A. O. Route.

From: AO

'Metal Mines Of Llanengan' Mining Ventures in a North Wales Parish.

By John Bennett and Robert Vernon

Published by Gwydyr Mines Publications.

Hardback, 149pp, includes 30 maps and diagrams, 20 black and white photographs. £15.00 (post Free) From www.moorebooks.co.uk

From the authors of "Mines of the Gwydyr Forest" a similar analytical and informed approach has been used with an infectious enthusiastic easy to read style which has been adopted. It is clear that some very in-depth research has gone into producing this volume - references from 1638 are quoted.

First question where is it? this is easily answered on the Lleyn Peninsula on St Tudwal's Headland south of Abersoch as opening chapter provides answers and maps to whet the readers appetite and set the scene for the rest of the volume.

There are plenty of maps and supporting diagrams which help support the detailed research information. The book is well styled and introduces the mining history in a logical sequence. It starts with dispensing with the usual Roman and Bronze Age connections. Mining started in the early 17th Century which documentation proves. The majority of taking place in the 18th and 19th Century with Lead, Zinc and Copper being produced in varying quantities. There are plenty of mine sections which will help anyone interested in finding out if there are any accessible workings.

There are very few remains left on surface and the underground is flooded. Typically of this part of Wales there are no old photographs. As a result I felt that there were too may photos of the Port Nigel Chimney including the nice colour one on the front dust jacket. There is however a very useful guided walk towards the end of the book which provides the reader with an opportunity to visit the area and see the surface remains and features which the book successfully interprets for you.

The authors have listed chapter by chapter all the source references to make future study easier. This is an excellent publication and sets a good standard, I also like the hard back quality at an affordable price. This area has not been covered before and will sit well within any collection of Welsh mining.

From: Mike Moore

'Hitler's V-Weapons Sites'

By Philip Henshall

Published by Sutton Publishing
ISBN: 0-7509-2607-4

224 pages list price £19.99

Books

Hitler's V (for Vengeance) weapons had a huge impact on London and the South East at the end of the second world war, killing over 8,000 people.

This book looks in detail at the sites that were used in Continental Europe to research, manufacture, store and fire these terror weapons. The emphasis is on the V1 'Doodlebug' and V2 rocket but other weapons never used in anger are also covered. Most previous books on the subject have concentrated on the detection and destruction of the sites during the war and on the damage wreaked on their arrival in the UK. The few books examining sites concentrate on the major locations such as La Coupole (Wizernes) and Eperlecques (Watten)and are often published in French. This publication focuses largely on the remains of sites that are still visible today.

A brief history of the weapons is followed by a categorisation of sites, in turn followed by detailed descriptions and plans of representative locations. Coverage of the sites in the Cherbourg Peninsular (where I deduce the author spent many of his holidays) is particularly comprehensive although none of these launch sites were ever operational. The multitude of launch sites is augmented by special locations such as the radar installation at Predefin. One area with little information is the main construction site at Nordhausen. The whole is illustrated with photos from the war (mostly PRO) and contemporary photos by the author.

Most of the smaller sites had at least an underground bunker and storage for propellant or hydrogen peroxide (used to power the V1 steam launching). Many of the larger underground sites will be familiar to those who have been on recent Sub Brit weekends in France. These include Siracourt (V1), Watten and Wizernes (V2) and Mimoyecques (V3 'pump gun'). The extensive test facilities at Peenemunde are also covered. One oddity is the storage site at Monterolier where the author believes poison gas was booby trapped to be released 50 years on, causing the death of a number of casual explorers and their would-be rescuers.

A comprehensive gazetteer and maps sandwich the content though this separation makes cross referencing a little clumsy. The maps are not detailed enough to ensure sites not described could be precisely located and the lack of an equivalent to the UK's national grid references compounds this. The bibliography gives extensive Public Record Office details but is a little light on other published works.

All in all, though, these are minor quibbles for what is a welcome addition for those of us who enjoy popping over the Channel and exploring and understanding more about the many hundred V-weapon sites.

Martin Dixon

'Caves and tunnels in South East England. Part 15.'

Editor Harry Pearman

By the Chelsea Spelaeological Society 27 / Research Report Kent Underground Research Group for 2001: iv + 62pp

£ 5.50 incl. p/p from Dr. A.R. Farrant (CSS Records), c/o British Geological Survey, Nicker Hill, Keyworth, Nottingham NG12 5GG

This issue contains the following main articles:

- Somewhere in the Home Counties (pages 1 - 3 and 6) [Modern 'recreational' excavations of tunnels in chalk]
- The Wilderness, Hargate Forest, Sussex - bunker (8 - 20) [By Ian Todd: results of enquiries concerning the history of this underground WWII structure]
- South East group Emergency Centre, Lunham Road, London (20 - 23) [Cold War structure below a block of flats in south London]
- 'Paddock', London - bunker (27, 29 and 30 - 31) [Alternative Cabinet War Rooms at Dollis Hill descriptions and plans]
- High Street, S. Peters, Kent - chalk mine (30, 32 - 33, and 34) [By Rod le Gear] [Plan Included]
- Hartley, Kent - chalk well (33 and 36) [By Mike Clinch]
- Albion Road, St. Peters, Kent - chalk mine (35 - 36) [By Paul Thorne] [Includes plan]
- Snape Wood, Wadhurst, Sussex - iron mine (37 - 39) [Mid 19th century ironstone mine - I ncludes sketch map, plan and section]
- Fort Borstal, Chatham, Kent (39 - 41) [Includes plans of tunnels]
- Gravesend- - ice well (42 - 44) [By Rod Le Gear] [Includes plan and section]

Additionally, there are numerous notes on collapses, deneholes, a 'notes and queries' section, and extracts from more or less obscure publications.

Paul W. Sowan

Books

Jubilee Line Extension

Author: Michael WINNEY, David BAILEY, et al

Published: 1999, ISBN: 0-7277-2782-6 Institution of Civil Engineers 132 Special Issue 2: 71pp

£ 25.30 incl. p/p from Thomas Telford Publishing, Thomas Telford Ltd., Units I/K, Paddock Wood Distribution Centre, Paddock Wood, TONBRIDGE, Kent TN12 6UU Email: orders@ice.org.uk

This is a professional level publication on the planning and construction of the Jubilee Line Extension of the London Underground railways system comprising new railways in tunnel from Green Park to Canning Town stations, and a surface railway from Canning Town to Stratford, as well as several new subsurface and surface and interchange stations. Introductory material sets the scheme in the historical context of the growth and planning and development of London's railways. The contents are as follows:

- Mike WINNEY - Introduction (page 2) David BAILEY - Foreword (3)
- Robert F. MITCHELL and Brian S. WEAVIN - Planning the Jubilee Line Extension (4 - 10) [Describes the history of the scheme from 1943 onwards]
- Robert W. EAST and Robert F. MITCHELL - Project management of the Jubilee Line Extension (11 - 18)
- Roland PAOLETTI - Architectural design of the Jubilee Line Extension stations (19 - 25)
- Hadyn R. DAVIES - Design and construction of the Jubilee Line Extension tunnels (26 - 35) Includes map and geological section and description of tunnelling through London Clay, Woolwich & Reading Beds and Thanet Sand.
- Richard P. BAILEY, David I. HARRIS, and Michael M. JENKINS - Design and construction of Westminster Station on the Jubilee Line Extension (36 - 46)
- Dennis A. DRAKE, Michael I. JACKSON, and Christopher I. DOUBELL - Design and construction of Canary Wharf Station on the Jubilee Line Extension (47 - 55)
- David J. LEGGETT, and Peter V.W. ARTHEY - Design and construction of the at-grade section of the Jubilee Line Extension (56 - 64)
- Ian JONES - Trains and electrical and mechanical equipment for the Jubilee Line Extension (65 - 71)

Paul W. Sowan

Front-line Kent: defence against invasion from 1400 to the Cold War

Author: Victor T.C. Smith

Published: 2001, ISBN: 1-901509-64-8, Kent County Council: 112pp

£ 7.95 (incl. p/p) from Kent County Council (Environmental Management Department), County Hall, MAIDSTONE, Kent

Whatever the merits of the contents of this book, it will probably be read less than it deserves as a result of the styles of printing and binding chosen.

The typeface chosen is small, and very small in some sections such as the gazetteer and index Much of the text and many illustrations are printed on coloured, often dark coloured, backgrounds making it much harder to read. The layout on the pages is extremely cramped.

As to the contents, the title indicates the scope. The main contents are arranged in order by periods, under the following headings:

- Introduction including brief discussions of geographical and technological aspects
- Castles and cannon
- Henry VIII's new fortifications
- Angular bastions and the Spanish Armada
- The seventeenth century
- The eighteenth century
- The French revolutionary and Napoleonic wars
- After Waterloo
- The Chatham ring fortress
- Technology marches on
- London's land defences
- World War I
- Air defence in the interwar years
- World War II
- The Cold War
- Gazetteer
- Glossary
- Bibliography
- Index
- Sites to visit
- Site map

Books

The author being V.T.C. Smith, the contents can be assumed to be accurate and complete within the confines of a small and very crowded book. A great deal of very interesting information has been crammed in, but purchasers are more likely to use it as a reference work than to read for pleasure, for the reasons given above.

Paul W. Sowan

Collieries of South Wales: 2

Author: John CORNWELL

Published: 2002 ISBN: 1-84306-017-5, Landmark Publishing: 192pp

£ 19.99 + p/p from Landmark Publishing, Ashbourne Hall, Cokayne Avenue, ASHBOURNE, Derbyshire DE6 1EJ. Tel: 01335-347349 Fax: 01335-347303

Email:landmark@clara.net

Web: www.landmarkpublishing.co.uk

This substantial hardback volume, in the same style as the earlier volume, is a photographic record of 29 collieries, using over 200 photographs, many of which are of underground views.

There is brief text and extended captions supplementing the photographs, and an index.

The photographs include surface buildings and plant, railways and rolling stock, drift entrances and shaft-tops, spoil tips, miners' housing, personnel, underground roadways and faces, and roadheaders and coal cutters. These are supplemented with some maps and mine plans.

The collieries featured in this volume are Aberaman, Aberpergwm, Abertillery New Mine (formerly Rose Heyworth), Bargoed, Bedwas, Blaenavon ironworks early mining, Blaendare, Blaenserchan, Bwllfa, Cwm / Coedely, Cwmburgwm, Cymmer, Elliott, Ferndale, Glyn, Glyntillery, Hafodyrynys, Llanhilleth, Llanover, Mynydd Maen, North Celynen / Graig Fawr, Scotts Pit, St. John's, Taff Merthyr, Treforgan, Trelewis, and Ty Trist.

There are sections on 'miscellaneous collieries,' landscapes of the Rhondda valley, South Wales coking works, coalfield housing, and steam locomotives.

Paul W. Sowan

The X site: Britain's most mysterious Government facility

Author: Tim JONES

Published: 2000 ISBN: 0-9522755-5-4 Gwasg Helygain Ltd: 80pp

£ 10.95 incl. p/p from Gwasg Helygain Ltd, 68 - 70 Kinmel Street, RHYL LL18 1AW. Tel: 01745-331411 Fax: 01745-331310

The site described is on the river Alyn south-west of Rhydymwyn village (SJ 2166), on the former Mold to Denbigh railway line, Flintshire (three miles NW of Mold.) It lies in an area where metalliferous mining has been carried on in the past, and had been the location of a foundry in the 19th century. Government interest in the site dates from World War I when a store for conventional munitions was established here.

Rhydymwyn's development from the 1930s onwards as an armaments research, manufacturing, and storage facility and, later, as a potential Cold War bunker, is described in this A4 book. The site remains in government ownership, secure and guarded, as a result of the likely presence of toxic and possibly radioactive residues, although the surface buildings are largely demolished, and the underground storage tunnels empty (they have been inspected by Subterranea Britannica members in recent years.)

Tim Jones has drawn heavily on central government and local authority records (of which details are supplied), now in the public domain, to chart the development and progress of the ROF Valley works, as it has been called, in three principal areas

1. Chemical weapons manufacture and storage - this was a site of prime importance from the 1930s onwards for the manufacture and storage of chemical weapons, especially those containing mustard gas and phosgene. Captured stocks of German chemical weapons agents such as Sarin or Tabun have also been stored here. Much of this material has subsequently been loaded into redundant ships which were scuttled in deep water between Ireland and Scotland!

2. Research related to the development of nuclear weapons. Prototype uranium hexafluoride diffusion cells for the separation of uranium isotopes U^{235} and U^{238} were trialled and developed here. The project in its early stages was camouflaged under the 'Tube Alloys' project name.

Books

3. The use of the site during the Cold War as a Buffer Depot (for the storage of non-perishable food supplies by the Ministry of Agriculture, Fisheries, and Food) and its potential use as a central Government control centre in the event of nuclear war are discussed,

The account also considers the historic and continuing environmental impact and planning implications of the Valley works.

Illustrations include an oblique aerial photograph of the site; a works site plan including railway connections and internal lines, buildings and other structures; and tunnel entrances. There is a representation of the layout of the purpose-built underground storage facility comprising four main tunnels, four cross tunnels, and two ventilation shafts. There are also 34 small black-and-white photographs showing the Rhydymwyn area, and abandoned site buildings and structures, railway lines, and tunnel entrances (but no underground views), and a site location map.

There are seven pages of detailed notes, three pages detailing primary and secondary sources, but no index.

Paul W. Sowan

News of the latest volumes in the series of Ure's Dictionary of Arts Manufactures and Mines by Dragonwheel Books

Both available from www.moorebooks.co.uk

Lead and Mercury, Mining and Metallurgy of the 1870's,

Author Robert Hunt

A4 Paperback 94pp - Dragonwheel Books. £12.95

This book covers the production and uses of the two metals.

The accounts of mining and metallurgy of lead are supplemented by its industrial uses in making lead shot and lead compounds, particularly white lead which was widely used as a pigment, sugar of lead, occasionally andillicitly used as a food sweetener.

Mercury was widely used for its ability to absorb other metals into an amalgam. The world-wide production and methods of refining are described. Also included are some details of the London Lead Company's peat processing works in Teesdale.

Tin and Zinc Mines and Industrial Uses of, in the 1870's

Author Robert Hunt

A4 Paperback 100pp - Dragonwheel Books. £12.95

Both metals were of growing Industrial importance in the 19th Century. They were used in alloys and for the protective plating in tin plate and galvanised iron. Tin Compounds also had an important use in the textile trade, as moredants in the dyeing process.

These articles from Ure's Dictionary examine these processes as well as the extraction and refining of the metals.

Mike Moore

Survival City
Adventures in Atomic America

Author Tom Vanderbilt

6 x 9 in., 224 pp, 80 b/w illus. April 2002

ISBN 1568983050 Price $25.00

The Cold War was the war that never happened.

Nonetheless, it spurred the most significant build-up of military contingency the USA has ever known: from the bunkers of Greenbrier, West Virginia, to the "proving grounds" of Nevada, where entire cities were built only to be vaporized. The Cold War was waged on a territory that knew no boundaries but left few traces.

In this fascinating--and at times frightening and comical--travelogue to the hidden battlefields of the Cold War, Tom Vanderbilt travels the Interstate (itself a product of the Cold War) to uncover the sites of Cold War architecture and reflect on their lasting heritage.

In the process, Vanderbilt shows us what the Cold War landscape looked like, how architecture tried to adapt to the threat of mass destruction, how cities coped with the knowledge that they were nuclear targets, and finally what remains of the Cold War theatre today, both its visible and invisible legacies.

Ultimately, Vanderbilt gives us a deep look into our cultural soul, the dreams and fears that drove us for the last half of the 20th century.

Princeton Architectural Press, Inc

ROYAL NAVAL CORDITE FACTORY - HOLTON HEATH

At 1045 hrs on Saturday a small but enthusiastic group of eleven Sub Brit members assembled in the General Office courtyard inside the office gates. It was only then that the scale of this facility began to be understood. Originally 3 miles of 12 ft high railing fence painted black surrounded the site. The Royal Naval Cordite Factory Association treasurer, Bob Honeybun who was to be our guide for the two and a half hour tour, joined us.

After a detailed history of the final years of the site post 1947 as an Admiralty Materials Laboratory (AML) the tour started on foot. During it's AML days, 200 scientists and research staff were kept busy studying materials in Navy use with some submarine habitability testing. Decca Radar and later Decca Records occupied a small section of the site from 1953 to RNCF closure in 1957, near the self-contained coal burning Power Station on site. In 1977 the AML became the Admiralty Marine Technology Establishment (AMTE). In 1984 a new name of the Admiralty Research Establishment (ARE) lasted until 1991 when they became part of the Defence Research Agency (DRA). Finally in 1996 they were absorbed by the Defence Evaluation & Research Agency (DERA) until final closure of the site in 1997. The remaining personnel were spread all over the country, mostly to Farnborough and Winfrith. Bob Honeybun had been part of this continuous period of change in the final years. Now only 1/6th of the original site remains controlled by the MOD and this is now up for sale, it will probably go for housing. We were to see what was left of a unique facility, rapidly disappearing into memory.

As we walked, Bob Honeybun explained why the site had been set up with the land for the site being purchased in 1915 and production of explosives starting in 1916 including Nitroglycerine (NG), Cordite MD, SC and later Flashless Cordite NF, Nitroguanidine (Picrite), Nitrated Cotton (Guncotton NC) with Nitro-Cellulose NC made from paper after 1929, Tetryl, sulphuric, nitric acids and acetone made on site.

The Royal Gunpowder Factory at Waltham Abbey had been the main production site for Cordite MK1, which was used as a propellant for shells from 1890. Unfortunately the quality was a bit iffy (technical QA term) and Winston Churchill in 1914, the then First Lord of the Admiralty, realised that Naval warfare needed uniform ballistics if the British Navy were to reliably hit anything other than water. The new improved Cordite MD propellant was made from NG and NC with some mineral jelly in a solvent acetone mix, looking rather like a bakers' bread dough. After several preparation processes the 'dough' was pressed into cord like thin strips and cut to length. These strips were dried and the acetone vapour recovered. After drying for up to four weeks depending on the diameter of the cords it was blended to assure a constant quality product with uniform ballistics. This was then used as bagged or case charges in a variety of guns, allowing the weapon (the shell) to get to its target. This whole manufacturing process of the explosive was dangerous and extensive safety rules on personnel and procedures kept it as safe as possible.

The most dangerous process on site was the production of Nitroglycerine (NG). This was made from commercial glycerine and mixed acids (sulphuric and
nitric) both made on site. NG is the starting point for producing many explosive propellants used in ammunition. Alfred Nobel developed its useful life by stabilising it in Dynamite and later Cordite propellant in the late 1880's. Interestingly he lost his brother in a NG accident about this time.

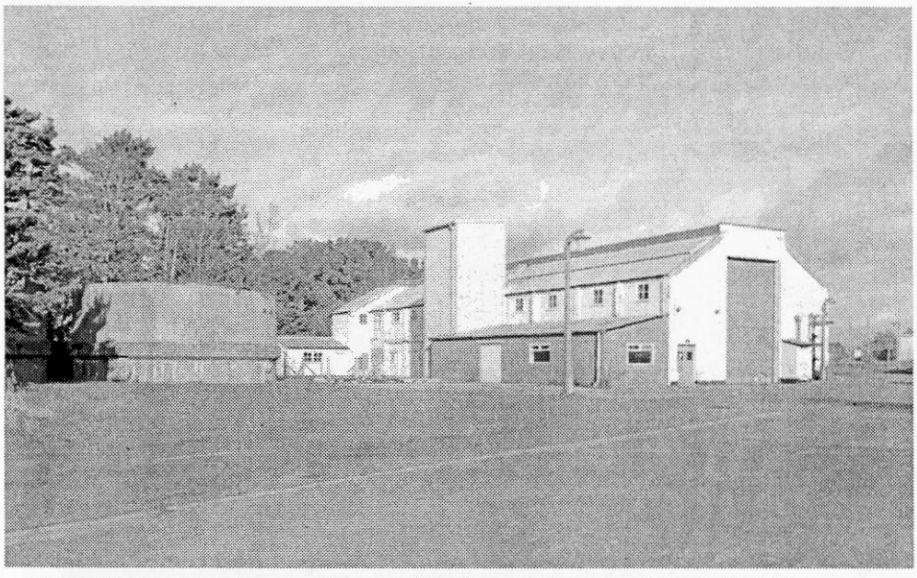
One of the reasons the site had been chosen was for its geographical feature of a gently sloping hill. The early production process used gravity to safely move this dense colourless liquid in open lead lined gutters. These open gutters had a canvas cover over them and were washed out after each batch to gather up any NG residue. It was this residue that allowed the serious accident in 1931 to spread about the site and subsequent designs at Caerwent abandoned their use. The Nathan, Thomson and Rintoul process made NG, which was the latest thing in 1916. This was made in the Batch-Wise system of 30-hundredweight lots. At 1043 hrs on Tuesday 23rd June 1931 a serious accident occurred on the NG hill. Ten NG Hillmen lost their lives. The chief chemist Mr Hazell who was in the main laboratory described a split second of "unearthly silence" as the air was sucked into the site by the explosion followed by a loud WOOF noise. The pressure wave generated knocked a passing motorcyclist from his machine on the main A351, a half a mile away. A column of smoke rose up from where the NG hill had been, with what appeared as red flames rising up in the wake of the massive explosion as one and a half tons of NG tried to find a more stable physical form. The red flames were probably the oxides of nitrogen burning off. The site was then inundated with falling debris from the buildings with a fine mist of acid continuing to fall over the next ten minutes, hindering the shocked fire fighters and setting fire to much of the surrounding dry heath. 19 others were injured on site.

The Committee of Enquiry revealed that by mistake, a mixture of NG and acid was allowed to run into a tank vessel trap not intended to receive it and that the operation to force the mixture back into the nitrating tank using compressed air caused the explosion. After this tragedy, safety modifications on procedures

ROYAL NAVAL CORDITE FACTORY - HOLTON HEATH

were improved and a new NG hill was built in 1935 with the help ironically of a German company using the then new Schmid continuous process. This involved building a two-story wooden building constructed inside a concrete bunker inside an artificial hill of 35,000 cu yds of soil. In 1957 the RNCF site eventually closed and the NG plant was then fully decommissioned. The internal wooden building of AB2 was removed and the lower containment levels filled with soil to the level of the entrance tunnels. Explosives were used to seal the entrance tunnels, although the remains of the entrances survived until 1987.

After the official visit was over some of our number inspected the surviving features including the NG Hill AB2 and can confirm there is very little to see in 2002. In 1940 the Caerwent site was built and many of the machinery was transferred including cordite presses and acid mixing equipment. The wet gutter process of NG movement from process to process being abandoned in favour of rubber wheeled trucks. At its peak of production in WW2 up to 4500 people were employed at Holton Heath. Transport by rail was extensive. Five miles of standard gauge track was to be found within the factory using two saddle tank locos. (A 0-4-0ST built by WG Bagnall no. 2596 was sold for scrap in 1961)



The acetone cooker house, with one of the fermentation vessels tothe left. The cooker house is where acorns, chestnuts or maize was cooked up

Fourteen miles of internal 2ft 6in gauge was serviced by fireless locos, (Andrew Barclay & Co Ltd supplied no. AB 1475), these use high-pressure steam stored in an insulated chamber. Later Rushton & Procter supplied electric open platform railcars. For the final approaches to the press process houses and other danger areas the rails were changed from steel to teak wood, this ensured no sparks within the danger area. The main Southern railway line from Weymouth to Bournemouth passed by the south of the site and was used to bring most of the raw materials in.

After the official visit some of our number also visited the only substantial remaining underground structure, Control Trench OP1, This was built during WW2 by the cut and cover process into a sandy hill from pre-formed reinforced concrete pipe sections and concrete beams. It was found to be completely dry and in excellent condition, looking as if it was built last year. The quality of build being a credit to the RNCF tradesmen who built it. It was approached from the lower level through a narrow single steel lined wooden door into the side of the hill, with brick buttresses on either side with characteristic 1940's design. The pre-cast sections were unusually shaped in an eclipse reminiscent of egg shaped sewers with an internal height of 6ft. Alongside the walls of the 4ft wide concrete sections were the remains of brackets for fold down seats as the tunnels were also used as air raid shelters. They were referred to on the site map as Refuges. After going into the hill for about 20ft there was a 90-degree turn as part of a sectional constructed 4-way junction. The other two exits were left as short alcoves. Then 15ft further into the main control area, which was like a large single car garage about 25 x 10ft, this had at least 10ft of soil cover above it and a 3ft diameter sectioned vertical shaft leading out of the far end of the ceiling via a side fastened steel ladder, silo style. This lead to the 8 ft diameter conical concrete roofed, brick built, horizontal slit walled observation room with a brick doglegged blast entrance. After two steps up to ground level it could be seen that the partially sunken OP would have had extensive 360-degree views over the whole of the factory. Today the legacy of planting 27,500 trees in 1927 obscures the view. It was used as a Home Guard control point. The two anti air raid decoy factories and anti aircraft fighting towers would have received their instructions from this point.

All thanks must go to Bill Ridgeway for organising a most unique trip. Bob Honeybun was most knowledgeable and an excellent guide. Everyone found something of interest from explosives, trains, architecture, industrial archaeology and the ultimate prefabricated 1940's bunker.

Bob Lawson

UNDERMINING VIMY

The task of defusing enormous mines at Vimy, a hazardous legacy of World War I, has fallen to a heroic group of engineers, reports **Andy Prada**

On November 11, thousands of people will gather on a famous windswept ridge in Northern France to commemorate the 1918 Armistice. That they may walk freely and in relative safety within the Canadian memorial site that sits atop the ridge is in some part due to the efforts of a small body of dedicated volunteers who, in 1997, came together to excavate and neutralise some of the most awesome and treacherous of all the weapons employed in the First World War: mines.

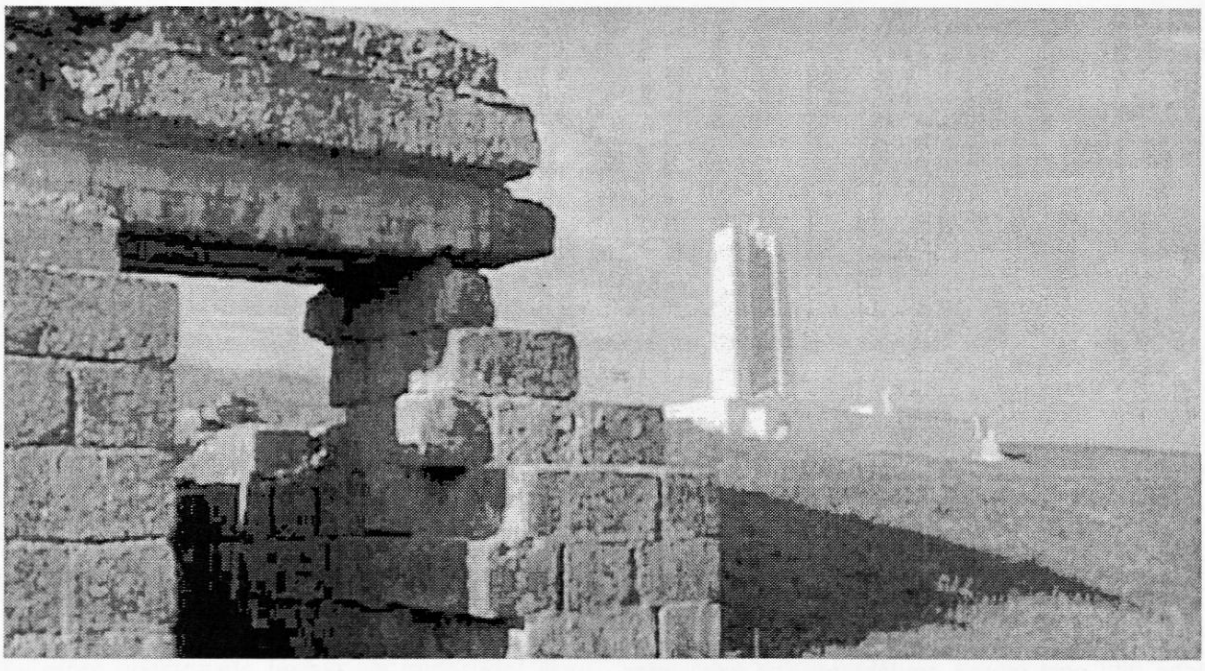
Vimy Ridge is special to Canadians. The battle that took place there on 9 April 1917 not only marked an outstanding military success in a stalemated war, it was also here that Canada was said to have finally came of age as four divisions of the Canadian Corps, fighting for the first time as an integral command, captured the ridge and drove back the enemy onto the plain below.

But victory at Vimy was underpinned by an altogether different type of war being waged under the ridge, a protracted and deadly subterranean struggle fought by tunnellers and miners on both sides. Labouring in secret in a labyrinth of passages deep below the surface, stealth, guile and high explosives were the main weapons--entombment, crushing or gas poisoning the main killers.

In 1915, early efforts by the French to counter a sustained German mining offensive under the ridge were taken up by the British who assumed control of the line in 1916, introducing the Royal Engineer Sappers to help their advance. The Sappers in turn brought speed and structure to the underground war and, by 1917, had dug tens of kilometres of fighting tunnels, communications subways and accommodation dugouts as well as water reservoirs, pumping and generating stations, and medical facilities needed to support a modern battlefield.

Although 1918 saw the end of the ìwar to end all warî, the legacy of that underground struggle would quite literally be a ticking time bomb for another generation of soldiers.

In 1988, in response to reports that black powder had been seen in one of the deeper tunnels within the site and mindful of the potential risks to the public that this could pose, the Canadian authorities enlisted the help of a volunteer group of British Army Royal Engineers to examine the fighting system directly below the Grange Subway--the most visited area of the Vimy site.



The remains of a German command post on the slopes below the Canadian memorial. No access has yet been affected into the substantial German tunnel systems under Vimy Ridge. They are thought to be at least as extensive as the British workings.

They were right to be cautious.

In 1955, a 26,000-lb mine exploded in a thunderstorm near the village of Le Gheer in Belgium making a crater 250 feet across and sixty feet deep. No one was hurt--this was, after all, a sleepy village set in relatively unpopulated agricultural land.

But the memorial site at Vimy--which has more than a quarter of a million visitors each year--was a different proposition.

Among their first discoveries, the engineering team found a 7000-lb mine--The Durand--within an abandoned French fighting tunnel. Tests on the explosive powder suggested a high degree of degradation and therefore thought it was unlikely to pose any danger to the public. Still, though the mine was left in place, the surface area above the chamber

UNDERMINING VIMY

was cordoned off. A decade later, Lt Col Phillip Robinson--the original expedition leader and now retired--produced evidence of a second, much larger mine. At 20,000-lb, the charge was lying abandoned under a busy road junction within the site--underneath a route traversed by hundreds of thousands of vehicles each year, not to mention the countless walkers, joggers and cyclists who use the site for general recreation.

In 1997, the Canadian authorities sanctioned yet another investigation which resulted in a remarkable search for the Broadmarsh and other mines at Vimy, now the subject of the film One of Our Mines is Missing! currently available on VHS and DVD.

In 1998, the tragic death of Lt Col Mike Watkins in a freak accident while attempting to open up another tunnel system within the site came as a great shock. By then, however, his own legacy--The Durand Group--a concept eagerly taken up by all those present at Vimy in 1997 and the subsequent visits thereafter--had taken shape.

Today, at the forefront of research into subterranean military features, the Durand Group can call on over 25 core members and associates--all with special skills that facilitate the work required.

In addition to three mines already defused at Vimy, the Group is currently working with the Canadian Heritage Conservation project, the Thiepval Interpretive Centre project and--concerning both the subterranean features under the City of Arras and the planned route of the Thelus Bypass around the Vimy Memorial--the Pas de Calais Archaeological authorities.

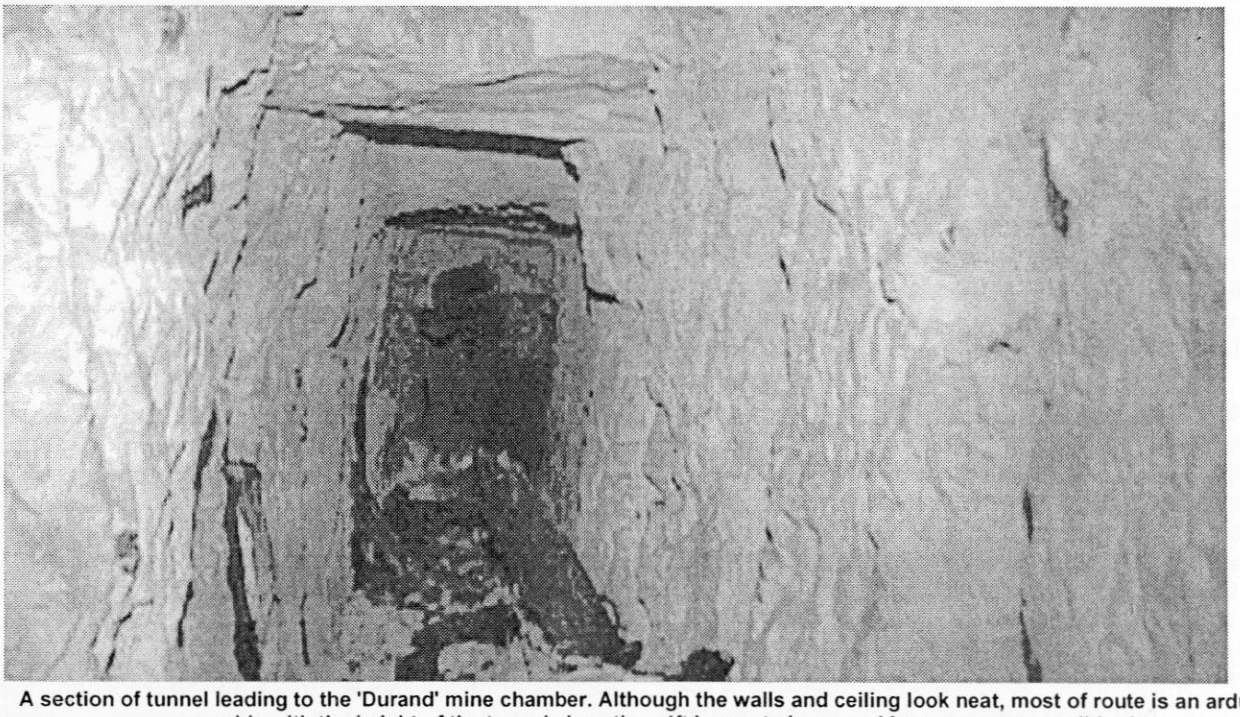
Members give their time generously, but as a voluntary collaboration of individuals, it is becoming increasingly difficult to fund major operations that require heavy plant and machinery from within group resources alone and we are currently looking to outside sources to alleviate the cost of further work.

The legacy that remains on and below the surface is historically important to future generations. But research is not always conclusive and invasive investigation can be dangerous.

The fact is several mine charges may still be lurking dormant at various locations under Vimy Ridge--six to the north of Souchez and four south towards Roclincourt--all outside the Canadian Memorial site and some perilously close to main traffic routes including the A26 Calais to Paris motorway.

Whatever the true count, one chilling fact remains: Some of these devices and their firing systems may be destablising with age, posing an increasing threat to public safety. All of which means, the French and Belgian authorities may soon have to ensure that this very real danger is no longer ignored.

Recently, the Durand Group--with its extensive experience in the field of Engineering, Mining, Explosive Ordnance Disposal and Historical and Archaeological interpretation--has become involved in helping to defuse a potentially explosive situation.



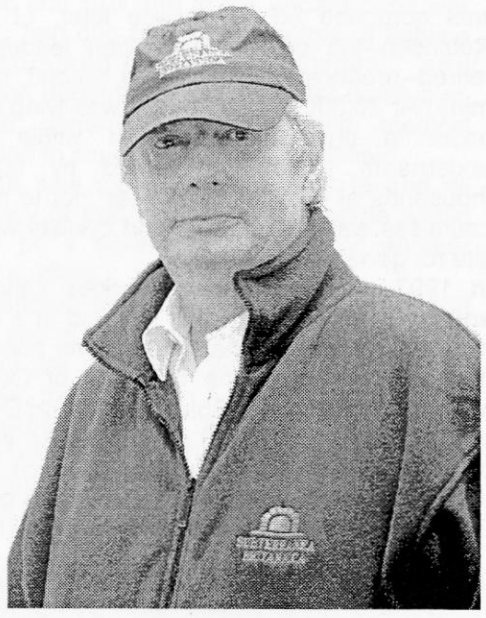
A section of tunnel leading to the 'Durand' mine chamber. Although the walls and ceiling look neat, most of route is an arduous scramble with the height of the tunnels less than 4ft in most places and in many areas - a slither!

For more information,
email: andyprada@fougassefilms.co.uk or visit the web site at www.fougassefilms.co.uk .

The Canada Post - November 2002

CLUB INSIGNIA PRICE LIST AND ORDER FORM

SUBTERRANEA
BRITANNICA



All items are in Navy Blue with the Subterranea Britannica logo and name in light blue.

Item	Size	Price	Qty
'Fruit of the Loom' Sweatshirt	S-36" M-38" L-40 to 42" XL-44 to 46" XXL-48"	£20.95	.....
Cotton polo shirt	S-36" M-38" L-40 to 42" XL-44 to 46" XXL-48"	£18.95	.....
Lambs wool V neck sweater	S-36/38" M-40/42" L-44" XL-46/48"	£39.95	.....
Baseball cap, unlined	One size fits all	£8.95	.....
Boiler suit	S M L XL	£31.95	.....
Full zip fleece	S M L XL XXL	£28.95	.....
Total purchases		**Value £.....**	.....

Name .....

Address.....

.....

.....post code.....

Telephone number.....

Please debit my credit card: Visa/MasterCard

Number.....

Expiry date.....

Signature.....

Postage and packing will be added at cost.

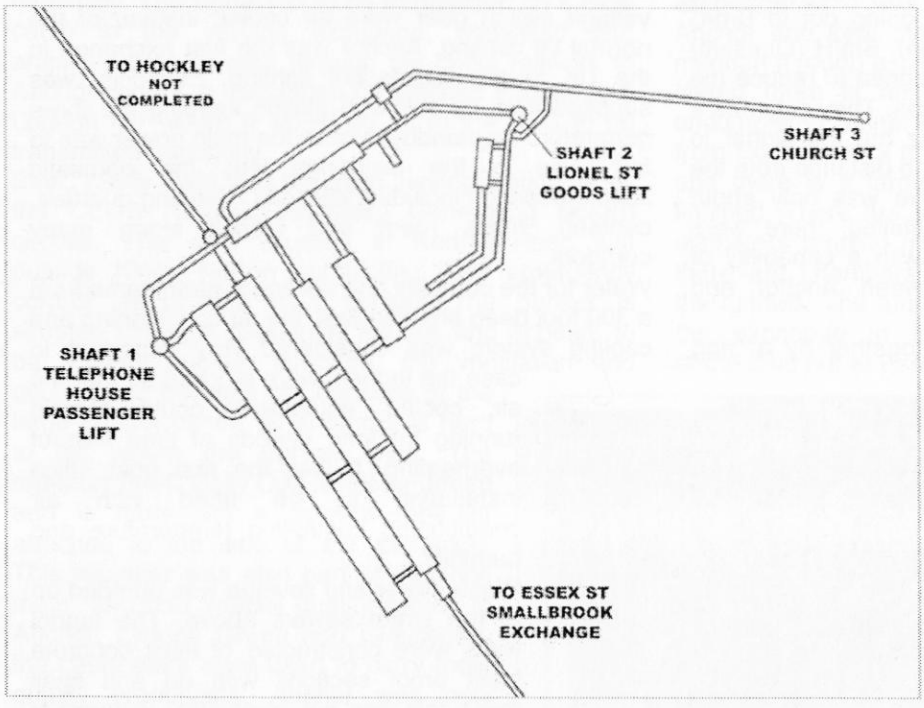
If you prefer to pay by Cheque, please telephone first to obtain postage and packaging cost. Other items are available on request, please telephone for a quotation.

Please return this order form (or a photocopy) direct to;

Rainbow Copy & Embroidery Services, Bath Road, Lymington, Hampshire SO41 3RW
Tel/Fax 01590 673 186 e-mail: sales@rainbowcopy.co.uk

Birmingham Anchor Telephone Exchange

In the early 1950's, the government planed to protect essential communications by building a series of hardened underground telephone exchanges. These



Birmingham "Anchor" Exchange Layout

were designed to protect the chain of communications even if a Hiroshima sized atomic bomb destroyed the city above. Due to advances in weapons they were obsolete by the time they were complete, however they still played an important part in national communications. There are three known exchanges, London (Kingsway), Manchester (Guardian) and Birmingham (Anchor). There is rumour of a similar centre in Glasgow although there is no hard evidence to confirm this exists.

Anchor takes its name from the Birmingham assay office which is above the exchange, the mark for Birmingham being an anchor. It was the largest of the three underground exchanges packed with equipment handling 250,000 automatic calls a day.

Construction of the new exchange started in 1953 with a cover story was that a new underground rail network was being built. Work progressed until 1956 when the public were told the project was no longer economic; nstead Birmingham got its underpasses through the city to help relieve congestion. Nobody had realised that an underground exchange and tunnel system 100ft below Newhall Street had been completed at a cost £4m. Birmingham's civil defence meeting records do not mention the exchange but that's not surprising as local government wouldn't have had a say in the matter.

The construction entrance was near Moor Street Station, where a slip road in the middle of the dual carriageway took a road down in to the tunnel complex to get large construction equipment into the site. Once work had finished this entrance was sealed off and the public were able to use the slip road to reach Moor Street station on the other side of the dual carriageway. This former entrance no longer exists following the re-development in Digbeth. At the time a student working part time on the construction site told his story to a student union magazine but to this day the author of the article has protected his source.

Anchor Trunk Non-director Exchange officially opened on the 9th November 1957, opening in three stages. Stage one consisted of the outgoing circuits from Birmingham; this was complete by the 20th November. Stage two was present incoming routes including the zone centres; this was completed by the 30th. The final stage transferred all remaining incoming routes to the new exchange. Although Anchor was officially opened at this time engineers had been busy preparing for this moment for over a year installing £2m worth of equipment.

The main way in to Bm/An (Anchor) was by lift at the rear of Telephone House. This was situated between Lionel Street and Fleet Street; there was a strict security check before entering the exchange. Another entrance was by a staircase across the road in Newhall Street. At the bottom of the lift there was a heavy blast door weighing about two tonnes, which could seal the entrance to the exchange if required. There was also a large concrete block that could be used to seal the ventilation shaft. Some of the tunnels also had airtight doors for added protection.

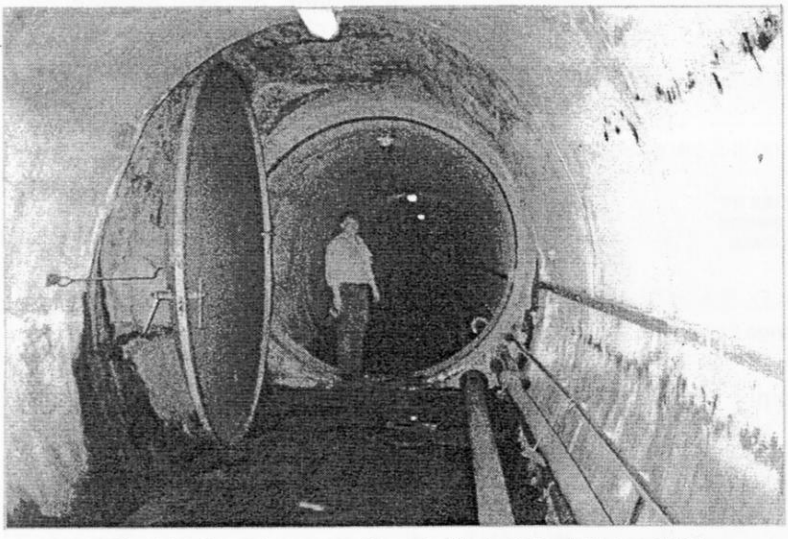
In 1956 there were about 100 engineers working in the tunnel complex and this didn't include private contractors who were responsible for some jobs. Everyone was issued with small pencil torches as the power would regularly fail. The engineers worked in teams of two on a 24 hour shift system operating in the exchange, this consisted of Auto Maintenance, Carrier Maintenance, Trunk Test and Power Maintenance. There was strict no smoking rules with staff only being allowed to smoke in the mess room. The fire officer is reported to have said that if a serious fire were to break out in the exchange the people down there would only have about 30 seconds to live.

Engineers worked for 15 months preparing the MRDF (Main Repeater Distribution Frame) All the repeater

Birmingham Anchor Telephone Exchange

station equipment on the speech band (50hz – 3400hz) terminated on this frame where the jumpering took place. There were also various copper cables (max 1000 pairs) going out to the repeater stations. These cables going out to Bm/C (Selly Oak), Bm/D {Lyndon Green), Bm/H (Queslett} repeaters with loaded cables designed to reduce the attenuation loss over long distances. They only had a speech band of 300hz – 3400hz but the signal to noise ratio was better. Because the distance from the frame to Telephone House above was only about 150ft unloaded cables were installed, there were about sixteen 1000 pair cables with a capability of 8000 speech circuits just between Anchor and Telephone House alone.

The repeaters were connected together by a "ring main" cable which carried mainly private wires and MOD circuits. These CCTS (circuits) were audio frequency but there were also carrier tie cables linking Anchor with these stations which were then relayed all over the country. The Lyndon and Queslett repeaters were hardened semi sunk bunkers with heavy blast doors. The frames and repeater equipment was housed on the upper level above ground. The lower level underground housed the standby generators and sub station.



Air tight doors in access Tunnel Photo © Paul Stokes 1999

The main exchange at Anchor was one upper level with another set of stairs going down further to the deeper level cable tunnels which lead off, unlit, into the distance. At the bottom of the lift shaft tunnels lead off in several directions to different parts of the exchange, a left turn to the repeaters and right the auto.

The main tunnel that was used is about the same dimensions as the London underground, running from Anchor to Midland ATE in Hill Street, from there the tunnel continued under New Street Station and on to the exchange in Essex Street. The tunnels carried many cables supported on metal racks set in to the walls. The main part of Anchor housed the generator hall, the exchange being DC powered, for safety reasons; the mains transformers and high voltage switch gear were air cooled instead of the normal oil cooling. Anchor was the first exchange in the UK to get fluorescent lighting. Electricity was supplied from its own sub station keeping the three generators for standby in case the main power was to fail. Also in the exchange was the domestic accommodation including kitchens, sleeping quarters, canteen, mess room and offices along many corridors.

Water for the complex and cooling system came from a 300 foot deep artesian well, the air conditioning and cooling system was considered very important in case the tunnels were blocked so that the air cooled equipment could remain running for long periods of time without overheating. It was the first post office installation to be fitted with air conditioning controlling temperature and humidity.

Waste water and sewage was pumped up to the street sewers above. The tunnel walls were constructed of thick concrete blast proof sections with an anti spall mesh this was not completely waterproof and allowed some water into the complex. At the time the main exchange was above the water table although some of the cable tunnels needed continuous pumping to keep them dry. Today the exchange is below the water table which has now raised 50 feet following the demise of local heavy industry and breweries that once used large quantities of water. Continuous pumping is now needed for the whole exchange and tunnel system with thousands of gallons a day being pumped out.

In the 1950's television was gaining in popularity every year. When only BBC was available their Birmingham studio was situated in Broad Street, all transmissions from there to London went through TV control in Telephone House. The picture signal and sound were sent separately, the sound being sent via copper cable. When Pebble Mill studios came online special copper cables were terminated in both Telephone House and Anchor to carry the speech paths.

In the early 1970's local radio stations really began to flourish. BBC Radio Birmingham and BRMB started expanding rapidly and to relay them out to the national network they had to be transmitted via Anchor because it was from here the circuits could be cross patched on to an OP (occasional program circuit also called Permanent CCTS). Up to the late 1980's Anchor had the main switching circuits and controlled all radio sound circuits in the Birmingham

Birmingham Anchor Telephone Exchange

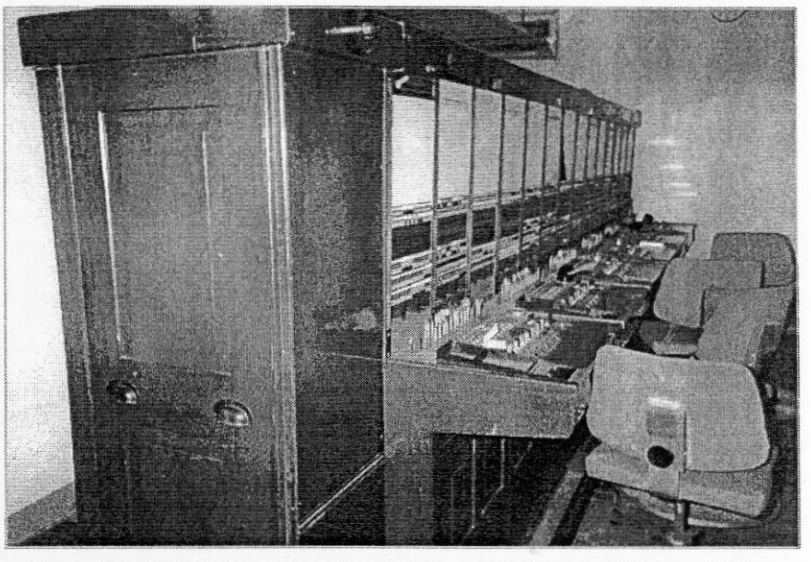
20,000hz) were installed all over the Midlands mostly terminating at Anchor. These were used for example if a football match at Aston Villa was being broadcast nationally. The signal would be transmitted on a local cable to the serving exchange, equalised and amplified then passed through the cable network to Anchor control. It could then be patched through to a London OP where it would go on to the BBC to be transmitted nationally.

Bm/C (Selly Oak) was the main serving station for all the CEGB (Central Electricity Generating Board) circuits. This was situated in Redhill Road just outside Kings Norton connecting their emergency control centre and their bunker. The bunker is situated amongst residential houses and appears to be a semi sunken structure, the ventilation and ducting can be seen but because of the large control centre all around it is hard to tell where the bunker ends. The repeater Bm/C Selly Oak is not hardened and is more like a satellite repeater attached to the side of the exchange. This repeater was also part of the "ring main" and had special quality cables to Anchor, Lyndon Green and Gloucester, the cable pairs were used to carry radio quality broadcasts. Anchor was only once put on standby during its lifetime; this was during the Cuba crisis in 1962. All ordinary engineers were replaced with chosen managers and no women were allowed.

There are several surface structures connected to the exchange still in existence, there is a goods lift in Lionel street; this is similar in construction to the one at Guardian (George Street} and is probably the exhaust for the complex being the tallest of the vents. Behind Telephone House is the intake for fresh air consisting of a large ventilation tower, there has been construction work next to this recently and a new office block built but the vent remains intact. Anchor would have had a positive pressure ventilation system to prevent outside contamination. There are various other vents that can be seen including St Chads where a small building is more than likely taking the mains electricity supply into the complex.

Anchor is now merely a relic of the cold war, it was maintained through to the 1980's when is became the terminal for a new fibre optic link from London. It has recently become out of bounds to even BT staff due to serious safety concerns and is no longer on care and maintenance. The water is still pumped out continuously because the exchange and tunnel complex still serve as cable runs to save digging up the city streets.

Subject to a government D notice for 15 years Anchor came off the secret list and press were allowed down there for the first time in the late 1960's. Two newspaper articles appeared telling of Birmingham's best kept secret, many GPO workers at the time didn't realise the importance of the exchange as it was referred to only by the name Anchor and kept strictly secret. These two articles mention a fourth exchange in Glasgow but as already stated there is no evidence that this exists. An uncompleted tunnel heads off towards Hockley and from Hockley back towards Anchor but they don't join and there is a large gap where this tunnel wasn't finished. There are seven shafts to the surface with diameters ranging from 22 feet down to 6 feet and there are chambers roughly every 500-600ft along the tunnels. The tunnels run on a decline away from the exchange in line with the surface contour of the land but at Essex Street the depth of the tunnel is only 60ft so even though the tunnels are on the decline the land drops away at a faster rate making the tunnel quite shallow by the time it reaches Essex Street.



Home Office emergency manual switchboard Photo © Paul Stokes 1999

The exchange was built at a deep level but the connecting tunnels were much shallower than this covering 1000's of feet. Even post office and BT workers interviewed that have worked at the exchange do not know the full extent of the warren of tunnels under Birmingham but if it was completed a tunnel would run beneath the jewellery quarter to meet the tunnel coming the other direction from Hockley. As completed it stops just short of the jewellery quarter.

In the opposite direction the same tunnel reaches Essex Street making it around 4000 feet in length. If the tunnel to Hockley had of been completed joining the section coming in the other direction it would have had a total length of 7500 feet, the gap is 1500 feet.'

By Sebastian Ballard

The German Government Bunker in Marienthal

In an extensive operation that was completed literally just before the door closed, Andreas Magdanz, a photographer from Aachen, has produced a photographic study of West German post-war architecture (see the end of the article for book details) and, in so doing, has brought to the attention of the general public a subject of major importance. A German government bunker in Marienthal - a huge underground complex lying in the idyllic Ahr valley 20 km south of Bonn, the former federal capital.

This "Emergency seat of the constitutional organisation of the Federal Republic" was designed to ensure that important bodies of the state would be able to continue to operate if a crisis occurred during the decades of the Cold War. The bunker was built between 1960 and 1971 "to serve as joint emergency accommodation for all constitutional organs of the Federal Republic in the event of a crisis or military conflict". Some 3000 government officials and members of parliament would have had a ambivalent chance to survive for 30 days, totally cut off from the rest of the world so that, from their underground perspective, they could govern a people which, in the event of a nuclear war, would probably have no longer existed. This complex, which was politically questionable and militarily way out of date, has completely lost its importance since the Eastern Bloc collapsed and the West German government moved to Berlin following reunification. Now it is to be "returned to its original state and sealed" at an unbelievable cost of DM 60 million after attempts to find alternative uses have failed. If Magdanz had not seen a notice in the Handelsblatt (www.handelsblatt.com), and had he not obtained permission from the Ministry of the Interior to produce a photographic documentation as a result of being inspired by Paul Virilio's "Bunker Archaeology", this absurd construction would have disappeared just as secretly as it was once planned, built and maintained over decades.

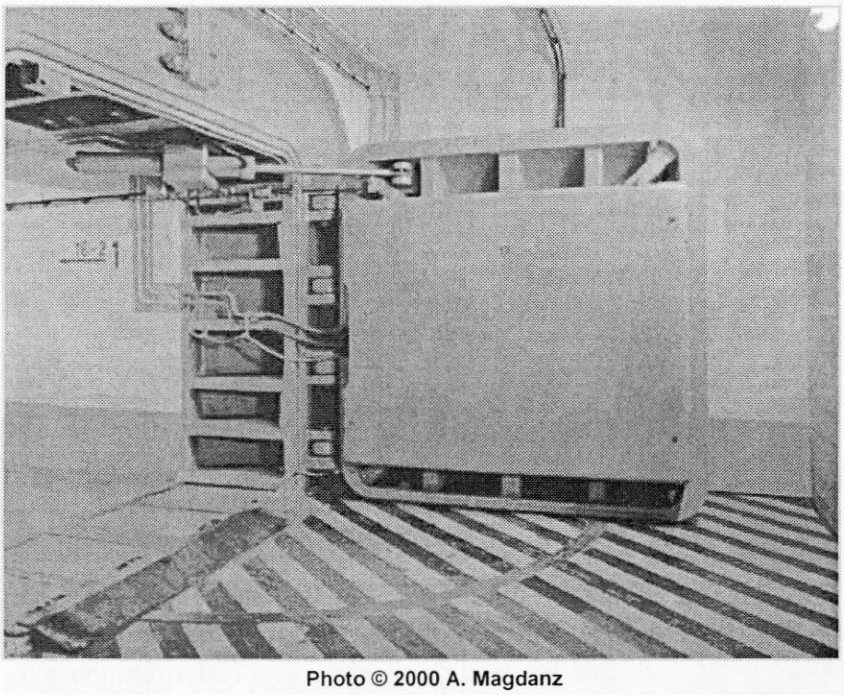


Photo © 2000 A. Magdanz

Its location and general design are based on a 4 km long railway tunnel, construction of which started in 1910 towards France, the then arch-enemy, but which ceased at the end of World War I. The French naturally destroyed the tunnel, but it was then later rebuilt and, towards the end of World War II, was used for the assembly of V 1 and V 2 rockets. When West Germany joined Nato, someone remembered the tunnel and saw in it the basis for a government bunker that would be ideally protected by the slate rock above it.

The Marienthal bunker, codenamed "Rose Garden" for cosmetic or cynical reasons, is the most extensive construction in Europe, if not world-wide. One cannot really use the word architecture to describe it since the rooms inside the bunker are purely functional, whereas the exterior is camouflaged in the guise of a peaceful vineyard. For this reason, it was engineers and not architects who were involved in erecting this monstrosity of German perfection. Five independently functioning units were built over an area of some 83,000 m² with a tunnel length of 19 km. The tunnel is on two levels and is divided by the valley floor. 936 spartan bedrooms, 897offices and conference rooms, five command centres, the same number of canteens, washrooms and hairdressing salons, five hospitals, together with operating theatres, were intended to provide the necessary fundamental requirements for selected government members. Interestingly enough, there is no library. On the other hand, the impressive facilities for fresh and waste water, ventilation and lighting match the size of the complex. We must also bear in mind that the taxpayer has in the meantime forked out some DM three billion for this "exclusive hotel". However impressive these figures and dimensions might be, we still cannot really imagine what the bunker is like in its entirety, especially since only a small-scale model of the complex is available. This mental shuttling between reality and fiction, past and present brings to mind a ghostly photo from 1945 which shows a smiling Adolf Hitler in his bunker as he gazes upon a model of his planned mega-city at Linz, while up above him in bombed Berlin the final battle

The German Government Bunker in Marienthal

is raging. Regardless of where we are in the Marienthal bunker, we never have a feeling for the full picture, we are always disoriented. This kafkaesque situation always caused feelings of claustrophobia despite the 38 links to the outside world, as is witnessed by the 180 strong team of maintenance personnel who were permanently present in the bunker, and some of whom still suffer from the after-effects. Moreover they were all men since the entire enterprise was purely a male domain. The technicians and white-collar workers were all given civil-servant status and sworn to secrecy, as were the soldiers who spent three weeks a year on exercise in the bunker, together with a group of government members who turned up annually. At the same time, however, there are also some engineers who were involved from the very beginning who now see their life's work being destroyed as a result of the closure. This underground scenario, which existed unnoticed for decades, thus reflects the overall fear-driven attitude of West German politics and society between 1960 and 1990.

Andreas Magdanz has prevented this politically, militarily and architecturally absurd monster from disappearing in total silence and has made it a subject of public discussion, not least due to the considerable attention paid to it by the press. The photographer, who was born in Mönchengladbach in 1963, spent seven months in 1998 and 1999 systematically researching the east wing of the complex where he took some one thousand photographs, primarily in black and white, using a plate camera to capture both major and insignificant details. One hundred of these photos have now been selected to create a "monograph of a building", which he has published at his own expense. Michael Naumann, the former minister of state, declined to provide any support for the project as it was not of "federal importance". Like the rest of his political colleagues, he fails to see that an artist is fighting here against the fact that, yet again, a piece of West German history is being destroyed without any public discussion. The government should not only pay for the photographs, it should also retain at least part of the complex as an authentic museum for visitors. What right do we have to be annoyed about the criminal destruction of cultural items by the pious warriors of the Taliban if we are depriving ourselves of memorials to our own history. It is hard to imagine that archaeologists might one day come across the bunker and classify it as an out-of-this-world object on German territory inhabited by people who are to all intents and purposes taking part in a "gas mask testing action".

For the want of a prominent feature from within the bunker itself, Magdanz has provided his magnificent coffee-table style book with an orange-coloured dust jacket, showing a bomber symbolically flying through the middle and obviously from the enemy's view point, from east to west. The logo comes from one of the countless magnetic strips that Magdanz found inside a cupboard in the military situation room and was, to his great surprise, allowed to photograph. When we see the huge number of military symbols on these strips, such as "Surface forces", "Interdiction flight", "Screen" or "Losses", the countless placenames and other cryptic symbols, not forgetting the political maps of the 60's and 70's, we start to get an idea of the unbelievable madness of these military sand-table games - played along the lines of the children's game "Submarines" - and their relationship to what could well have been a nuclear world catastrophe.

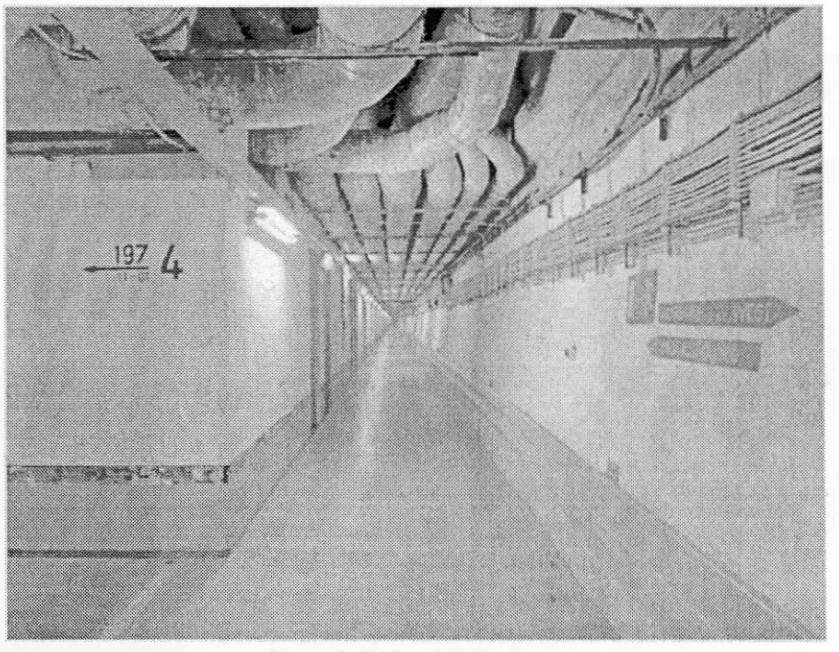


Photo © 2000 A. Magdanz

The photographs illustrate the route that a visitor would travel within the East Bunker, moving from section East/West to East/East. They start with an entrance door at ground level that instinctively recalls the guard towers of communist East Germany. This is followed by a picture showing one of the control centres which, in turn, is followed by a photo of a heavy airlock door. The photographer thus brilliantly involves the observer from the very start in the ambivalence of the bunker, which is both fascinating and horrendous in its detailed and yet abstruse planning. This purely documentary volume reveals both the creative and dramatic skills of this

The German Government Bunker in Marienthal

experienced photographer, who studied at the Aachen university under Wilhelm Schürmann. For example, in order to hold the attention of the observer, he scatters amongst the normal black-and-white photos the occasional colour photograph with its lead-like lighting that reflects the reality of the scene. These thus form a break between the individual chapters, while at the same time capturing the frozen aesthetics of the 70's. He shows, for example, the red covered chairs in the conference room that is lit by orange-coloured lights, or elsewhere the hairdressing salon with its violet-blue seats. Compared with this scene, when we look at the shower room through the glass window we think instinctively of the perfidious "cleaning methods" used in the concentration camps. Magdanz has left the furniture fittings in the bunker totally untouched - tons, as they slowly close, or by the ventilation system, or what is left of it.

This video film can at present be seen at the "Alte Rotation" exhibition in Bonn. The architecture of the Rheinisches Landesmuseum in its temporary location provides a suitable backdrop, providing an impressive, if minimal insight into Magdanz's complete undertaking. Original objects taken from the bunker are exhibited between a few of the photographs, for example a truck loaded with ugly, post-office grey telephones or an electric carriage, or some of the seats already mentioned - both inviting and rejecting in their nature. However real these requisites might be, taken out of context, they fail to create that same atmospheric effect that comes from the photos and video, let alone from a visit underground.

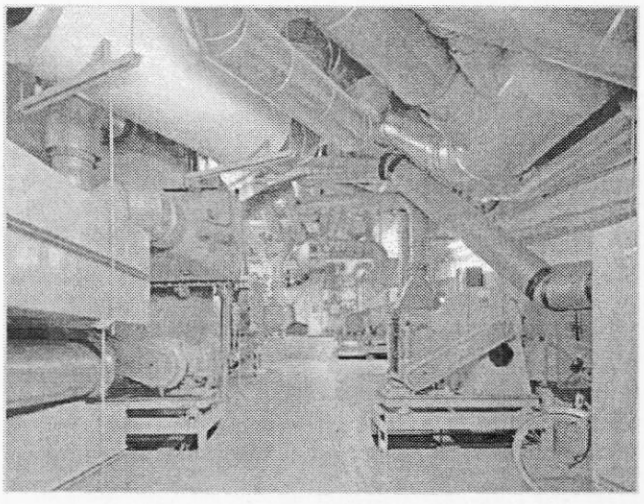


Photo © 2000 A. Magdanz

most of them had already been removed at the time he was taking his photographs - and as a result has captured clinically sterile rooms and still-life scenes with tools inadvertently left behind. In accordance with his strategy, he manipulated nothing and dramatised nothing: The naked facts are more than sufficient to create a feeling of fear. In particular, the huge elements of the bunker's technology, which are to be found everywhere, and the countless threatening warning signs, these fear-inducing close-ups interpose themselves dramatically between the otherwise objective reporting.

What the photographs might fail to provide can be seen in a supporting one-hour video film. In a range of sequences, Magdanz leads the observer through endless cathedral-high corridors and arched tunnels, producing a feeling of vertigo stemming from the monotonous movement, as if a violent jaw is about to open up, but naturally less abstract than the "Canal" video by Fischli/Weiss. This aggravating movement through the bunker is accompanied by dull echoes or hissing noises, caused by the heavy doors, weighing

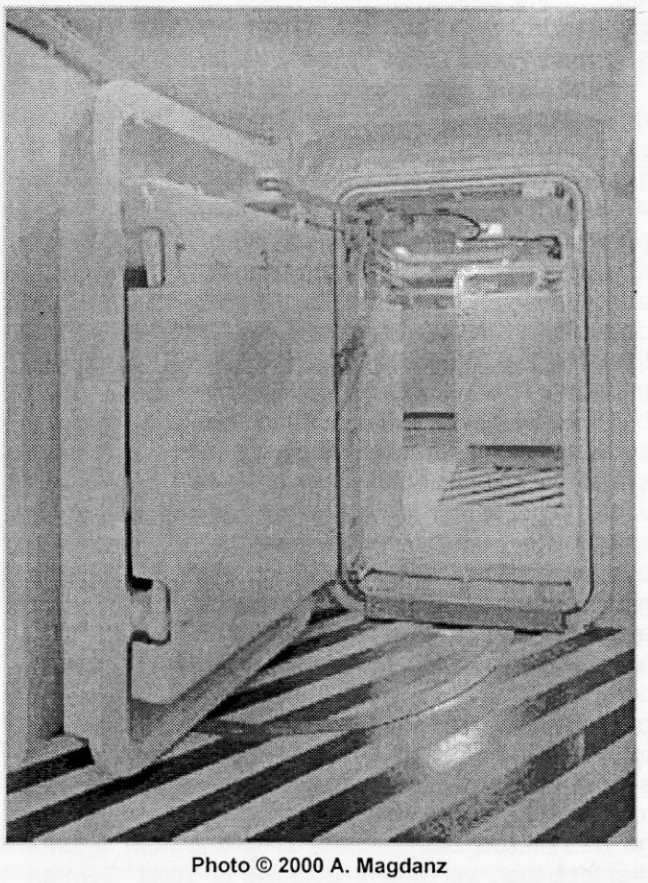


Photo © 2000 A. Magdanz

Book: Dienststelle Marienthal - Eine Gebäudemonographie (The Marienthal Government Bunker - Monograph to a Building), Aachen,

The Book and Video, and many of the photos mentioned are available on line from www.dienststellemarienthal.de

By Renate Puhvogel

TAZ News Agency March 2001

Home Fit for a Dictator

Could Saddam's Bunker Survive Today's 'Bunker-Busters'?

When allied forces fired three cruise missiles at a conference center in Baghdad on the first night of the Gulf War in 1991, their real target was underneath it: a state-of-the-art command bunker belonging to Saddam Hussein.

The missiles slammed into the conference center and it was blown to smithereens. But the newly built bunker, protected by shock absorbers and a 16-foot-thick shell of reinforced concrete, survived intact, according to a former Yugoslav engineer who helped build it.

"It was completely functioning. All the installations and equipment survived. It only shook from side to side when the three cruise missiles hit," the engineer said in a recent interview in Belgrade, the Yugoslav capital. He requested anonymity because of concern for his own security.

And what happens if U.S. forces and their allies launch a second war against Iraq? The engineer says the so-called "bunker-buster" may just do the trick in destroying Saddam's underground lair.

Surviving a Direct Hit

Saddam's bunker is modeled on one built for Marshal Tito, the late Yugoslav dictator, under a mountain in southern Bosnia, which was part of the former Yugoslavia. Tito's bunker is now maintained by the Bosnian Army.

When Saddam visited Yugoslavia in 1976 — he was Iraq's vice president at the time — Tito bragged to him about his luxuriously appointed bunker, which was built to house 500 people and survive a nuclear attack.

Saddam became president in 1979, and during the 1980s Tito sent the same engineers who built his bunker to build a smaller version for the Iraqi leader near the Republican Palace and the 14th of July Bridge in central Baghdad. The engineer who spoke to ABCNEWS was a lead member of the design and construction teams on both projects.

"They both have the same degree of protection," he said. "They could survive a direct hit from 2,000 kilograms of TNT or a nuclear bomb from two kilometers away."

Protected by 16 Feet of Concrete

Tito's bunker has the natural protection of between 60 meters and 250 meters of Bosnian mountain granite above its chambers, but in the sandy plain on which Baghdad stands, the only option was to build a protective shell of reinforced concrete, according to the engineer.

Because of Iraqi security concerns, the Yugoslavs started by building a 16-foot-thick concrete roof. "We built the roof and raised it, and then under the shadow of that roof, all the contents inside were built," he said. "When you took an aerial picture, all you saw was 50 by 90 meters of concrete roof."

Raising a roof the size of a football field was such a feat that Saddam himself came to see it, the engineer said. "Because the roof itself weighed 4½ thousand tons, raising it was a miracle of civil engineering. The minute it was done, all the workers had to move out so he could come with his officers. He greeted us. He was happy. It was successful. He couldn't believe it himself that we could lift the roof up that way."

After building the conference center on top of the roof to disguise the true nature of the site, the team turned their attention to the bunker itself. The extensive complex is surrounded on all six sides by the concrete shell, and gets additional protection from a layer of elastic shock absorbers designed to deaden any impact, whether from an earthquake or an air strike.

The entire structure is anchored by a latticework of horizontal and vertical steel and concrete beams driven as far as 300 feet into the sand beneath it. The horizontal beams prevent the vertical ones from slipping in the unstable footing.

Self-Sufficient Living Space

Saddam's installation bunker was designed to support the leader and his staff for up to 30 days in the event of a conventional attack, and five days in a nuclear attack. Plus, the engineer said it has these features:

- A "technical block" with huge storage containers of water and fuel, and an American-built turbo-diesel electric power plant.
- A "sanitation block" with filters for air and water designed to avoid any contamination from nuclear, biological and chemical weapons. The engineer said the complex has an air-conditioning system built by American Carrier, a U.S. firm.
- A "command center" with modern communication systems, including one built by Thomson, a French company, and an American-made H-field electronic security system to prevent monitoring by the enemy.
- An elaborate series of baffles and buffers to suppress blasts within the complex, including anti-blast doors that can withstand the impact overpressures of a conventional bomb blast.
-

Both bunkers contained luxurious appointments for the two leaders, the engineer said. Tito's contained Louis XIV-style furniture and gold-plated taps. While the rooms in Saddam's bunker were smaller, "he also wanted luxury at the top level," the engineer said. "With Saddam there is this difference. He has three wives, so you have to make three wives' bedrooms, plus a fourth for — how shall I put it? — for servicing Saddam."

Home Fit for a Dictator

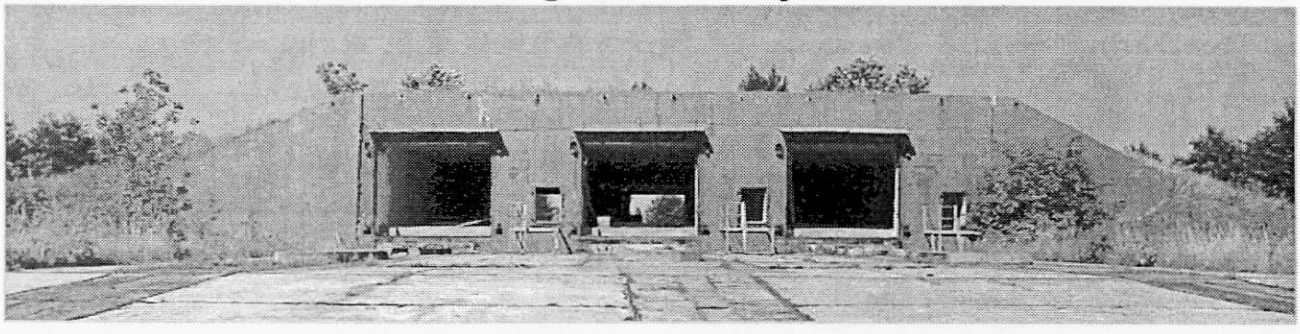
Another difference is that Saddam's bunker has only two emergency exits — making it dangerously inferior to Tito's, the engineer said. "At Tito's bunker we had five emergency exits with five separate routes across the mountain.... It will be much easier to bury Saddam Hussein. If you hit one exit directly, then the other, he's got just 90 hours to live inside."
Saddam's bunker was completed in 1990, the engineer said.

Vulnerable to 'Bunker-Busters'
If the United States and its allies go to war with Iraq again, the engineer does not believe they would succeed in destroying Saddam's bunker with the kind of conventional ordnance that NATO forces dropped on Serbia in 1999 during the Kosovo conflict.

But he believes that specialized "bunker-buster" weapons might have a chance. In the dozen years since cruise missiles first failed to destroy Saddam's hideout, a top priority for U.S. military research and development has been to develop shells hardened with depleted uranium and equipped with time-delay fuses. The weapons are designed to smash through a bunker's concrete shell, then explode inside.
The engineer who helped build Saddam's bunker believes that the new weapons might have a chance of breaking through the 16-foot concrete shell and destroying what is inside. "Three laser-guided bombs, one after another? Case closed. Kaput," he says.

By Dave Marash and Dada Jovanovic ABC News.com Jan 8th

The Vega Missile System



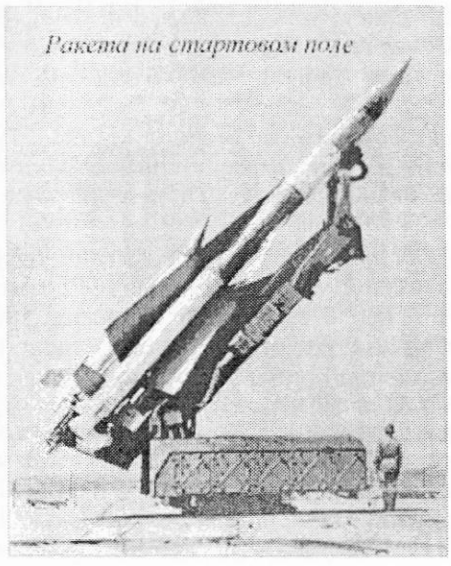
FRAG-411 facility at Badingen

Technical Description – VEGA

Country of manufacture:	USSR
Codename:	SA –5
NATO codename:	Gammon
Russian designation:	Vega S-200 / Bera C-200
Guidance:	Radio command plus active radar terminal homing
In active service:	wef 1985
Users:	Russia,Ukraine, Poland, Iran, North Korea & Libya
Notes:	Designed to destroy high altitude supersonic targets, including missiles, large aircraft formations, AWACS, etc. Only known active combat use by Libya. Near End Of Life [NEOL], although there is a 'digitalised' version available from Poland. A two-stage missile: launch stage using four solid-fuel boosters, cruse stage using liquid fuelled engine.
Length:	1076.4 cm / 35.3 ft approx.
Diameter:	75.2 cm / 2.5 ft approx.
Weight at launch:	7018 kg (fuel 586 kg, oxydator 1680 kg)
Weight, 2nd stage:	3910 kg
Warhead:	97 kg (37,000 steel balls weighing 2 and 3.5 kg)
Effective range:	0.3 – 280 km

The Vega Missile System

Launcher:	Automatic loading ramp, two per bunker, rail guided. After launch of first missile, the second loading / launcher machine moves out to launch table
Target acquisition:	Upto 450 km (ground based radar)
	Upto 350 km (missile radar)
Cruise speed, max:	1400 m/s
Target height, min:	0.3 km
Target height, max:	35 km
Destruction zone:	17 km (target height upto 1 km)
	240 km (target height 12 – 20 km)
Destruction probability:	72 – 98%
Missile complex:	6 launcher sites, each with two loading / launcher machines
Transport vehicle:	KrAZ-260



East German (EGER) Air defence (AD) missile units

The following notes are intended to discuss the position of the Vega units within the EGER air-defense (AD) missile system.

The national AD system (in Russian PVO: this term was also frequently used by the EGER's) was initially a separate service (like army, navy, etc.), but was later incorporated into the air force. Air defence, both national and that of the land forces, was always given high priority (under Russian pressure) within the individual countries of the Warsaw Pact. This applied in particular to the Soviet forces in EGER (Group of Soviet Forces in Germany – GSFG –, later Western Group of Forces – WGF) and EGER itself.

EGER was divided into two AD areas, responsibility for which lay with the two AD divisions (in German LVD): 1st LVD at Cottbus in the southern half, 3rd LVD at Trollenhagen in the northern half of the country.

The AD were responsible for co-ordinating the operations of the fighter squadrons and the AD missile brigades. The structures of the two AD divisions were not identical as the 1st LVD had responsibility for an area that extended well to the north of Berlin, i.e. the bottom four states in the current eastern Germany (Brandenburg and Berlin, Saxony-Anhalt, Thuringia, Saxony), whereas the 3rd LVD was responsible only for Mecklenburg-West Pomerania.

1 LVD comprised at one stage, for example, four fighter squadrons, and two AD missile brigades (also not identical in their structure). An AD missile brigade (FRB) could (I emphasize: could) comprise 2 – 3 technical battalions, each with 4 – 5 missile detachments (FRA with missiles: Volchov / SA-2 Guideline), plus a missile detachment group (FRAG), consisting of 6 launcher sites each with two loading / launcher machines (see tech notes above).

The bunker tour in 2002 visited the FRAG-411 facility at Badingen, to the east of Gransee, where the bunkers with the two sets of rails leading out to the single launch table, the "radar hills", service facilities (maintenance, storage, etc.) are still available, albeit in a rapidly deteriorating state. The 1 LVD had a second FRAG facility at Eckolstädt (which was never completed), while 3 LVD included FRAG-431 at Prangendorf within its organisation. There was also a Soviet VEGA facility at Lohburg to the west of Altengrabow which looked exactly like the Badingen facility. Supposedly there was also a VEGA site in what is now the Czech Republic (calculated from topographical plots), but the precise location had not yet been confirmed.

Internet Sources:

http://www.wonderland.org.nz/rasa.htm #S-400
http://www.wonderland.org.nz/sa5-1.jpg *(for Sa5-1)*
http://www.wonderland.org.nz/sa5-3.jpg *(for Sa5-3)*
http://pvo.guns.ru *(In Russian, but an English version is also available)*
http://home.t-online.de/home/Militaertechnik3/Tagebuch/VdKBA/S200.html

By Mike Barton

RAF St. Twynnells 'TWY' GCI Rotor Radar Station

In the summer of 1940, a West Coast chain home radar station was established at SR92459757 called RAF Warren, in July of the same year a chain home low radar station with a duplicate was built at SR92149727 called RAF St. Twynnells, this is ¼ mile south west of RAF Warren. In 1941 Type a brick combined transmitter and receiver block replaced the earlier Chain Home Low huts at St. Twynnells.

Both Warren and St Twynnells were involved in trials which took place in December 1941 to test the ability of IFF Mk III to respond to various kinds of radar station. A total of eight ground radar installations, seven aircraft and a sloop demonstrated the value of IFF Mk III to British and American observers and universal adoption was recommended.

R6 Operations Block © Nick Catford

In the 1950's when the Rotor radar project was set up a GCI station was constructed at SR94189741 in an R6 two level surface bunker. This was also called RAF St. Twynnells and was just over a mile from RAF Warren. The target date for completion was 18th September 1953.

The fitting out of St. Twynnells was moved to last in a list of 14. PRO File Air2/10984 Appendix A shows a control 1A RADAR (Type 80) was planned for this site, this was deleted before fitting as the rotor programme had been cut back and there were no Type 80's available. The modulator building was built and still stands in an adjacent field on the opposite side of the nearby road. 1 Type 11 (M) Mk 7, 2 Type 13 Mk 6 and 3 Type 13 Mk 7 radars were installed. No Type 14's are shown allocated and there is no record of a Type 7.

After closure, the site reverted back to the local farmer and the majority of buildings associated with the station are largely intact. Only the standard RAF style guardhouse (slightly shorter than the standard rotor guardhouse) is in separate ownership. Standing alongside the road it has been converted into a house and externally remains largely unaltered except for the veranda, which has been modified to form an extra room.

The standby generator house stands at one end of the operations block and is now an empty shell, at the other end is the transformer building which still retains its rusting transformer. One radar plinth stands in the field along with a small building with some electrical equipment, this may have been for the mobile Type 11 radar but this has not been confirmed. Closer to the road there is an underground Royal Observer Corps post, this has been disused since 1991.

On the opposite side of the road there are four more radar plinths and the Type 80 modulator building. The disused radio station in the field to the north of the modulator building is not believed to be anything to do with the site.

St. Twynnells was one of 5 R6 bunkers built, the others being at Hack Green (later converted into an RGHQ and now a museum), Hope Cover (later converted into an RGHQ which closed in 1993 and now used for storage), Langtoft (a scrap dealers store) and Treleaver (largely derelict with some farm storage). Of the three R6 bunkers that were not put to later government uses St. Twynnells is by far the best preserved. Although all the radar equipment has been removed much of the plant remains intact as do some of the original signs and situation boards. Unusually for a derelict rotor building, all the flimsy internal partition walls are intact and in good condition, many retaining their original paint. There is some standing water on the lower floor but this is 'below the floorboards' and rarely more than an inch in depth. Most of the surviving equipment, plant and artefacts are on this floor.

Although the building was open for a number of years it is now securely locked and visits are discouraged. No use has ever been found for the building and the owner is considering applying for an EC grant to demolish it.

RAF St. Twynnells 'TWY' GCI Rotor Radar Station

Site Visit

After several unsuccessful attempts to arrange an internal inspection over many years the owner finally agreed to a visit by members of Subterranea Britannica on 26th October 2002. There were no restrictions on photography and we were given unlimited time to explore the bunker.

We entered via the emergency exit located at the top of a short flight of stairs covered by a porch protruding from the eastern end of the blockhouse. At the top of the stairs are the original steel blast doors which open onto the upper east – west spine corridor. Before going through the blast doors there is a dogleg on the right into the main air intake room with ventilation trunking running from the main intake high on the south facing wall. There are two small fans mounted on the wall.

Once in the main corridor, the narrow back stairs down to the lower level are on the left. Beyond this the 'domestic' rooms are on the left consisting of RAF and WRAF rest rooms and toilets. All the rooms are empty with some vandalism as many of the WC's and hand basins are smashed. There is a small kitchen between the RAF and WRAF rest rooms with a serving hatch into each of these rooms. The kitchen still has a tiled wall, sink, cupboard and a food preparation table. In the RAF rest room the ventilation trunking which runs through each room just below the ceiling turns sharply downwards through the floor to the lower level where it feeds the apparatus fan in the plant room below.

Beyond the domestic rooms is the GPO power room which again is empty apart from an old piano and organ. Beyond this is a small store and the main stairway down to the lower level. The winch that was fixed to the ceiling above the stairwell has gone. Beyond the stairs a short corridor to the left leads to the PBX room which is again empty. The main corridor then turns to the right through the second set of blast doors to the main entrance at the bottom of another flight of stairs in another protruding porch. There is a small guard room at the bottom of the stairs.

On the right hand side of the spine corridor the first room is the officers rest room. Beyond this are three rooms with windows looking down into the well of the two level operations room. The three rooms are 'Intercept Cabin No. 4', 'Chief Controllers Cabin' and the 'Fighter Marshall's Room'. All the floorboards have been removed from these rooms but the glass windows are surprisingly unbroken. Beyond these, a short corridor on the right leads into the 'Synthetic Trainers Room' with four small offices accessed from both sides of this corridor. Beyond this on the right is the 'Track Telling Room' again the floorboards have been removed although the under floor cable trunking remains in place.

The final room on the right had no raised floor and is accessed down a short flight of wooden steps. This is the C.F.P. or 'Centralised Filter Plot Room'. The two Kelvin Hughes projectors would have been mounted in this room but as no Type 80 radar was ever installed at St. Twynnells, the projectors weren't installed either and it's unclear what the room was used for.

There is a five foot high cableway below the spine corridor, it was possible to lift up a trapdoor in the floor and climb down into this. The cable hangers are still in place along both sides of the wall although the cables have all been removed. A number of truncated cables still run through the wall into this area.

From the bottom of the back stairs the first room entered from the left of the lower spine corridor is the air conditioning plant and switchgear room. This is subdivided into a number of small rooms with brick partitions, there is also a raised area accessed by a ladder (removed) from the floor of the plant room and through a narrow door in the back into the corridor.

The plant room is accessed through double doors leading onto six wide concrete steps. Two compressors were mounted to the left of the steps with two compressed air cylinders above them, all that remains now are the two concrete plinths where they were mounted. At the back of the room within it's own room the main air conditioning fan is still in place and behind it in a separate room a large bank of filters standing floor – ceiling. The ventilation trunking runs up to another fan above.

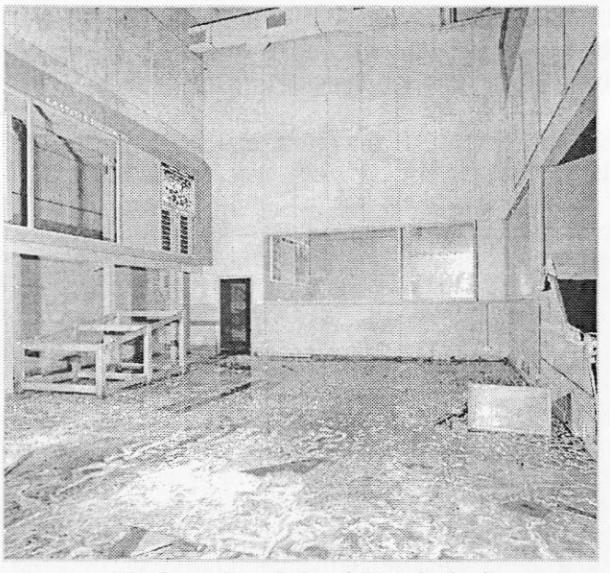
The control cabinets and switchgear would have been to the right of the entrance steps but this has all been removed. Opposite the steps is the raised area with the control equipment and pumps for the Baudelot heat exchangers. There is a control box with five circular dials on it. The heat exchanger unit consisting of coiled metal pipes is mounted behind the pumps. Water would have flowed by gravity over the outside of the pipes. A narrow raised walkway runs alongside with narrow doorways into two small rooms. The first room contains the apparatus fan which is still in place, the ventilation trunking feeds into the fan from the upper floor; the second small room is empty.

There are a number of signs still in place on the pumps and fans and one on the water tank for the heat exchangers which says 'check level of water in

RAF St. Twynnells 'TWY' GCI Rotor Radar Station

Baudelot tank weekly this should not be lower then 2 feet below the overflow when all pumps are static'

Beyond the plant room is the radar generator room with two large concrete motor beds which mounted Metadyne motors (rotary converters). Their purpose was to take the electric supply from the plant room and convert it into 'radar compatible power' (high frequency and high voltage), the motors have been removed. Beyond this is the Radar Room and then the GPO apparatus room which has Darlington acid proof tiles on the floor.
On the right hand side of the spine corridor the first room entered is the 'Control Cabin' with it's glass window still intact looking into the 'Operations Room'. There is a large wall board on the back wall

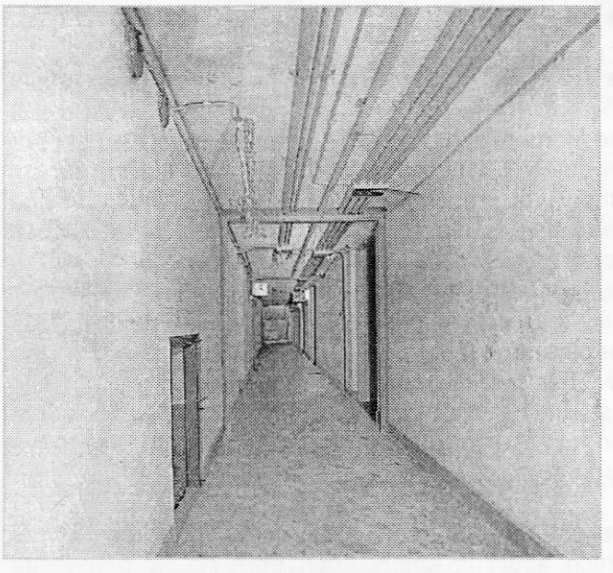


The Operations Room © Nick Catford

consisting of a notice board with blackboards on either side with painted headings. The left hand board is headed 'Weather' with sub headings: 'Date', 'Time', 'Height', 'Wind speed', 'Wind Direction','Temp', 'Tropopause Height' and 'Contrail Height'. The right hand board has columns headed 'Base', 'COD', 'Call sign' and 'Frequency GCI'

The next room on the right is 'Intercept Control Cabin No 2' which still has its glass window looking into the 'Ops' room. The next room has lost it's glass, this is the 'Projector Room' for projecting images onto the wall of the 'Ops' room. The final room with a window into the 'Ops' room is 'Intercept Cabin No. 3'
Beyond this a short corridor leads into the large 'Operation Room' itself which was originally entered down a flight of three steps. This is the largest room in the bunker spanning both floors. 30 feet high with windows looking into it from both levels. The floor is damp but there is no standing water. The wooden tote board frame is still in place along the left hand wall although the backlit Perspex displays have been removed. The wording above the two displays says 'Mission Tote' and 'AA States - Frequencies' There are wall boards on either side of the tote, the board on the right has the heading 'General Weather' and below it 'Airfield State' with 16 columns. Part of the sloping wooden framework that supported the large plotting table is still in place on the floor.

Beyond the 'Ops' room entrance corridor the next room on the right is the 'L' shaped radar office with a radar workshop filling in the 'L'. The floorboards have been removed but the under floor metal cable trunking is still in place with various connection sockets and distribution boxes. At one point the trunking runs up the wall with all the cables still in



The Main Corridor © Nick Catford

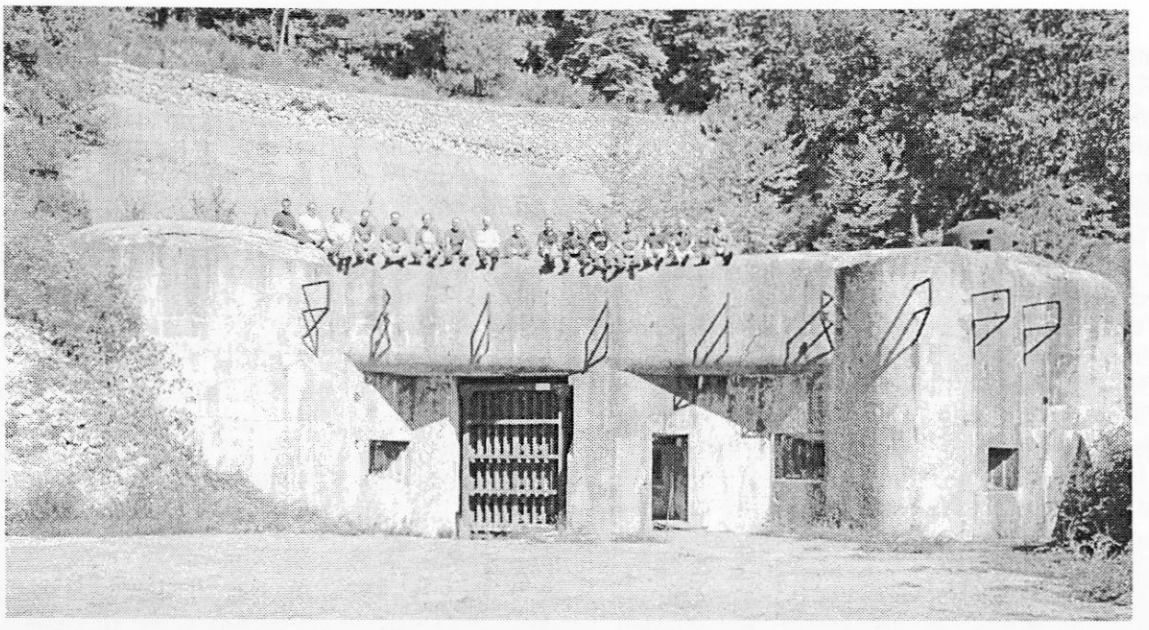
place. The final room on the right hand side is the 'Utilisation Room' which would have housed the underside of the Kelvin Hughes projectors. The metal beams to support these are in place at ceiling level but the projectors were never installed.

Returning to the other end of the lower corridor three concrete steps lead down into a lobby with three further rooms one of which has a further three wooden steps up again. This is the voltage regulator room which still has a large floor standing electrical control cabinet. At the back of the room there's a strange device that resembles a robot but is, in fact, the main power intake.

A septic tank and filter beds at the bottom of the field complete the structures on this site.

By Nick Catford

The Maginot Line in the Alps



After our first highly successful and enjoyable trip to the Maginot Line forts in Thionville in eastern France in 2000 I and the rest of the party were quickly hooked. Having read about the forts in the Southern Alps Dan McKenzie began to arrange another excursion it was going to take a lot of planning with hotels, air transport and hire cars to book and suitable sites to be found so rather than go the following year Dan decided to buy some time and organise the visit for 2002. In the meantime we all went back to Thionville, a relatively easy and short drive from Calais, in 2001.

Day One - It was eventually arranged that we would fly out to Nice from Stanstead where we would pick up two mini buses and drive to our base at Menton described as one of the most Italian of towns on the French Riviera, right on the Italian border. From there all the forts in the 'Alps Maritimes' sector of the Maginot Line were within relatively easy reach.
14 members of Sub Brit and one American guest gathered at Stanstead Airport early on 23rd September. Our 'Go' flight left on time and was only half full. We touched down at Nice Airport on the Côte d'Azur in the middle of a storm, not a good omen for the week ahead. We did get some rain during the week but most of it was in the evenings just as we were walking to a restaurant!

We met Sub Brits Mike Barton (who had masterminded the 2001 and 2002 East German tours) at the airport and when to collect our two mini busses. There we encountered a problem, although the hire company had a record of Dan's advance booking there were no busses available for us. No problem however, they agreed to give us three people carriers, one with a free tank of petrol that didn't need refilling on return. What could have been a disaster ended up as a 'right result'.

We headed off in convoy along the motorway that snakes thorough numerous tunnels high above the Riviera coast, we even managed to find an English radio station, Riviera Radio, with news on the hour from the BBC. 30 minutes later we arrived at the ancient city of Menton and found our hotel overlooking one of the many yacht marinas. By now it was getting late in the day and although our programme suggested a 'swim in the Med' everyone opted for a quiet evening and a nice meal. There are literally hundreds of restaurants within easy reach and it was quickly apparent that half our party were a bit choosy about where they ate while the rest of us were happy to go to the closest nosherie. The food was generally good wherever we went and surprisingly cheap. Luckily we had two fluent French speakers in the party and most of the rest spoke 'un peu' so there were no problems ordering food and drink. A relaxing end to the day, with the promise of plenty of underground exploration to come.

Day 2 - dawned dry and sunny. Continental breakfasts vary from country to country, in Germany we got a huge buffet of cold meats and cheeses, too much for most people to eat, in France they tend to be less generous with bread and jam the only items on the menu, the next day some of us supplemented this with our own food from the local 'Supermarche'. We were joined at breakfast by our second American guest Clayton Donnell, it was Clayton's web site that had first fired Dan's interest in the Maginot Line. After a less than hearty breakfast we set off in convoy. The plan for the week was to visit a mixture of sites, two preserved and restored, one museum

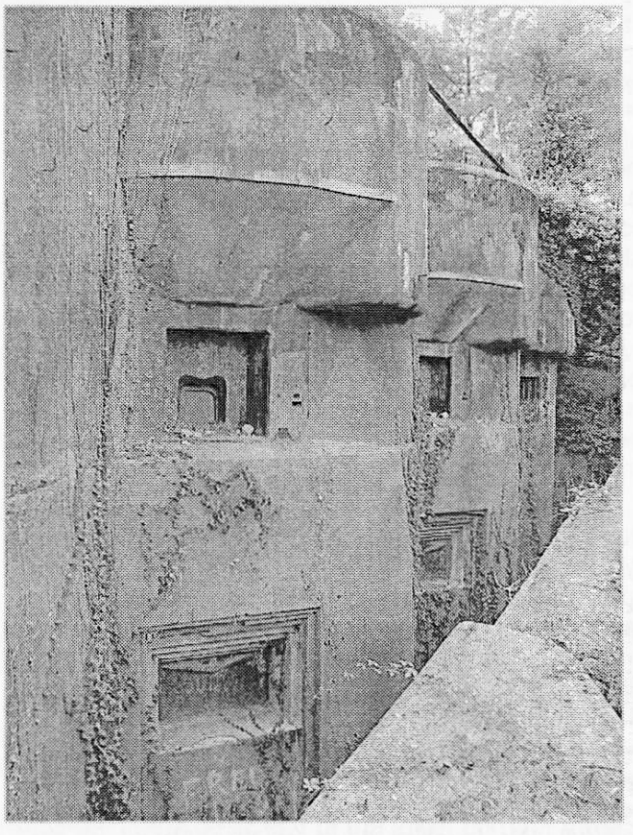
The Maginot Line in the Alps

with public visits and a selection of derelict sites. In Thionville we found many of the derelict sites wide open but we had heard that in the Alps many of the abandoned forts were locked and inaccessible so it was a matter of 'suck it and see', hopefully we'd find some of the doors open. We carried a selection of ropes, an electron ladder and abseiling equipment and we felt that any forts that were open could be explored but no attempt would be made to enter those that were locked (with a key) without permission. Most of the forts we were planning to visit were 'Gros Ouvrages' large forts with a number of fighting blocks but we also planned to see some 'Petit Ouvrages' small forts that were only lightly armed.

Our first visit was to CAP MARTIN a Gros Ouvrage (344 men) on the western outskirts of Menton and in fact the southernmost fort on the Maginot Line overlooking the Mediterranean. Cap Martin was one of the few Alpine forts to be attacked, Italian forces failed to make much of a dent anywhere on the line, but they did make one notable assault. Showing great determination, they advanced right up to Cap Martin (Block 3, a casemate for two 75 mm canons and two 81 mm mortars) The block suffered some direct hits including some on its embrasure, but it remained effectively in action, having sustained only minor damage. The Italians reached the surface of the fort, and all attempts to dislodge them failed until, late in the day, the other forts in the vicinity were called to direct their fire on to the fort. This finally forced the Italians to withdraw. The ouvrage incurred some minor damage from the supporting French 155 mm guns. This was as close as the Italians came to ever capturing a Gros ouvrage, which was better than their German comrades ever achieved.
The fort consists of three blocks with the main road west from Menton passing between Blocks 1 and 2. We parked in a lay-by overlooking the city and looked down on Block 2 with its observation cupola looking over the city and its marinas. We climbed down in front of the block but there was no access into the fort so we climbed back to look at Block 1 on the north side of the road. This was the main entrance to the fort with it's drawbridge over the 12' deep 'fosse' well and truly closed. We made no attempt to climb down the steep cliff to Block 3 which was blown up by retreating German troops in 1944. Although described in books as derelict, the main entrance block to Cap Martin had been fully restored and is in excellent condition. Unfortunately there was no indication of who owned it or how to get in so we moved on to the next fort.

From Cap Martin we drove north to ROQUEBRUNE, another Gros ouvrage close to the D50 road. First we had a look at some abandoned and derelict barrack blocks a short distance from the fort. Roquebrune consists of 4 blocks we looked at Blocks 2 and 3 from the surface but there was no means of access. We found the entrance (Block 1) on the edge of a building site. There were several cars outside and we could see the internal lights were on but nobody was at home. We enquired on the building site and were told that the fort was used as a store by the local garidinare (parks department) and there would be someone there between 12 and 1, unfortunately we didn't have time to wait.

We drove on to COL DES GARDES (111 men) a petit ouvrage on the left hand side (going north) of the D22. Block 1 is right by the road but there was no access at this point so we walked to Block 2 the other side of a low hill. This is not a fighting block and



Roquebrune - Block Three

consists of little more than a door with one machine gun embrasure covering it. The footbridge over the fosse was missing but we were able to retrieve it from the pit and get across to the door. Although it was locked we were able to reach through a hole in the door and release a bolt to get in. A short stairway brought us into a long corridor, at the bottom of the stairs there was a bank of carbon filters that would have been used in the event of a gas attack. At the end of the corridor is a 'T' junction with the main corridor to the fighting blocks, Blocks 3 & 4 to the

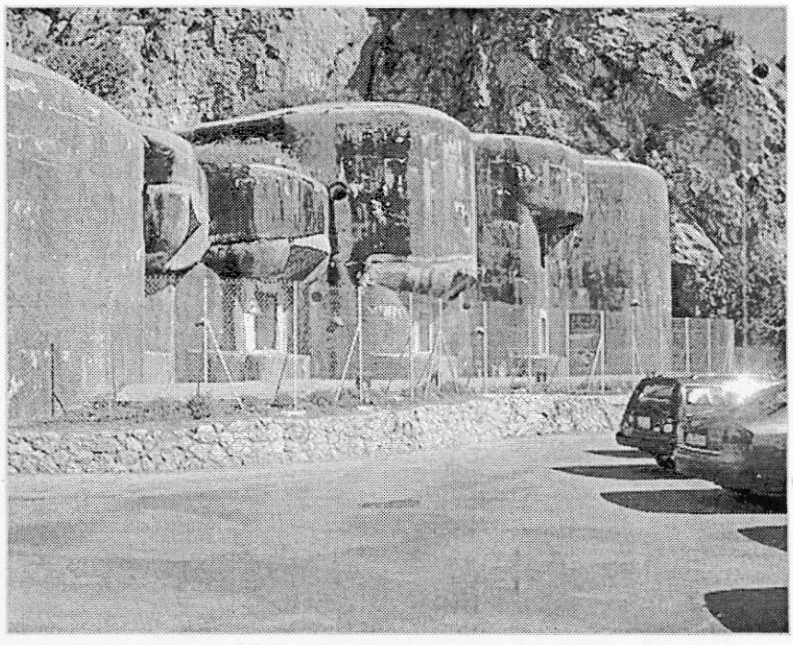
The Maginot Line in the Alps

right and Block 1 to the left. In most Gros Ouvrages the blocks are reached by stairs, often several hundred of them, but at Col des Gardes they were accessed by ladder. Some of our members ascended the ladders but the blocks had been stripped of their light arms and were empty. There are several empty rooms accessed from the main corridor including a number of toilet cubicles, dormitory (caserne) and the generator room (usine). The small single diesel generator is still in place and in good condition. It was good to get underground at last even if it was only a small fort.

After lunch at St. Agnes we visited another petit Ouvrage COL DES BANQUETTES (74 men). This is a very small fort with three blocks with Block 2 consisting of nothing more than an entrance door into the hillside with no covering fire. All three blocks are on the same level and are linked by a corridor with a few short side galleries and rooms. Both Blocks 1 and 2 are open (entry into Block 1 involved jumping across the fosse) and the fort has been almost completely stripped and used for parties. There is a makeshift bar and bottles and other rubbish strewn all over the floor. One room just inside Block 1 still retains its filtration plant with one carbon filter cylinder.

Next we drove to MONT OURS. It is unclear what kind of fortification this was but as it was nearby and marked on the current 1:25,000 map we decided to take a look. The fortification was situated at the top of a steep hill accessed by a long and rough winding road with very tight hairpins. It was too far and steep to walk but as the gate at the bottom was open we decided to drive carefully up to the top. It took about 15 minutes to drive what in distance can't have been more than a couple of kilometres. As we got to the top we noticed a blue van parked. It was unmarked but driven by Gendarmes who told us we'd have to drive down again as they were about to lock the gate. There was no problem being there as it was a public footpath but we'd have to walk back. We followed the Gendarmes down to the bottom but declined their invitation to walk up again as it was a long way, very steep and probably not worth seeing anyway.

We retraced our steps to ST. AGNES (2450 feet above sea level) where the Gros Ouvrage museum opens daily (in the summer) at 3pm. We arrived just after 3, just in time to find a rather glum looking stubby Frenchman locking the door. He was obviously a 'jobs worth' we'd missed the first couple of minutes of the tour and he was determined we weren't going to join it. We'd have to wait for the next one at 4.30. We sat down and waited! About 40 minutes later the visitors returned, all five of them. We approached the tour guide and suggested that as we had a party of 17 he might like to bring forward the time of the next tour he readily agreed and offered us a group discount of about £2 per head which seemed very reasonable. Unfortunately photography and video was strictly prohibited and the stubby glum Frenchman with a hooked nose followed us around at all times. He had a security badge on and his fixed scowl never altered until one of our party tried to descend into one of the areas that were 'off limits'. Several people had already been down



St Agnes - Bloc Two

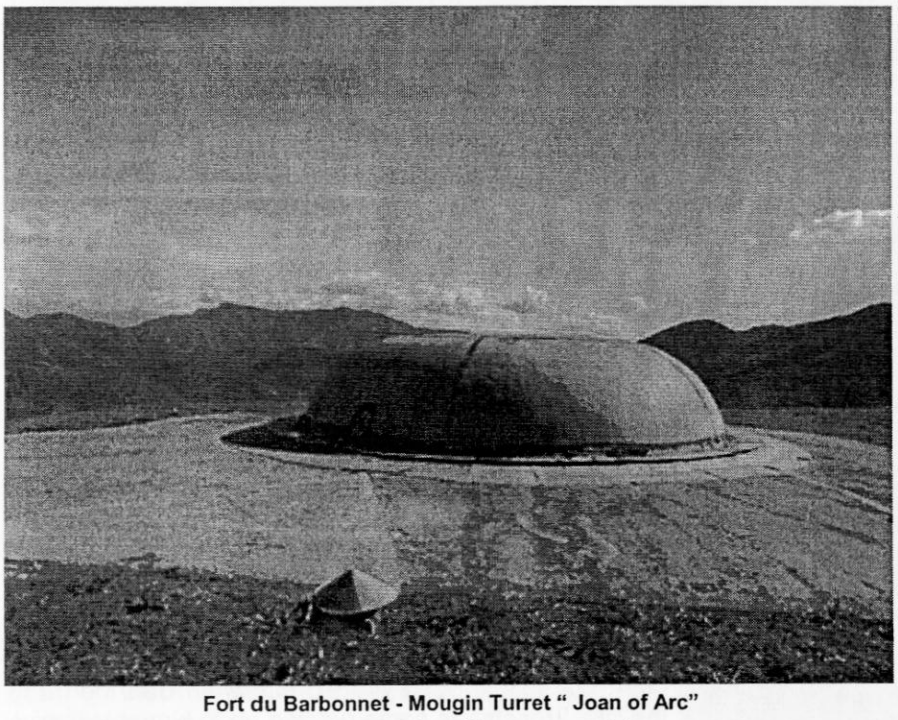
there and hadn't been spotted but when Dan tried it the little Frenchman came running up to him shouting "No No No" it could almost have been a scene out of Laurel and Hardy film. Our French guide, Mr. Ray, was very knowledgeable about St. Agnes and interested in the Maginot Line in general. He gave us a very long and detailed tour and by the time we emerged at about 5.45 we had seen almost all of this well preserved and well restored ouvrage. I can't help feeling sorry for anyone waiting for the later advertised tour, they had a long wait and as soon as we returned Mr. Ray went home.

We started the tour with a short film about the village of St. Agnes and the fort, luckily and surprisingly it had English sub titles. The fort had been maintained and occupied by the army until the end of the cold war. It had been retained as it might be required as a nuclear fallout shelter or a nuclear proof command

The Maginot Line in the Alps

centre. In the early 1990's it was handed over to the village and now run as a tourist attraction. When fully manned the fort would have held 280 troops. We were able to see three of the 4 blocks, Block 1 is the entrance block.

It was explained to us that although the Gros Ouvrages in the Alps generally have internal tramways for moving ammunition around, because of the compact nature of the forts and the close proximity of the fighting blocks to the entrance they are all hand pushed tramways rather than the overhead electric traction employed in many of the larger forts further north. Another major difference is that all the Gros Ouvrages we saw had an entrance drawbridge over the fosse (usually found raised) and a smaller men's entrance alongside with a removable footbridge across to a steel door. Drawbridges are not seen at the northern forts.



Fort du Barbonnet - Mougin Turret " Joan of Arc"

Immediately inside the entrance the generator room is to the left with its three marine generators and compressors in excellent working order. On the opposite side of the corridor is the large filter room with two banks of carbon filters in large cylinders along both walls. Beyond these is a junction to the right leading to Block 2 and beyond that on the right hand side of the main corridor the 'caserne' with all the domestic and command rooms. Some of the dormitories still had their bed frames while others had replacement wooden boards across the frames. This area included fully equipped workshop, kitchen, toilets, washing area, an infirmary with original beds and screens (much of the other equipment here came from a local clinic). Probably of most interest was the command centre consisting of several rooms (including a telephone exchange) with situation boards, telephones, a safe and a mechanical signalling device for contacting each block with orders; where and when to fire. The blocks would then signal back to the command centre that they had received these orders. Because of the noise a visual device was essential. We were able to climb up to Block 3 to see the 75 guns and 81 mm mortars that were still in place on two levels. We also saw Block 2 which is the largest fighting block on the Maginot Line and the only one consisting of three levels. Again all the gun, both mortars and canons were still in place. Our tour ended at this point and we returned to the entrance. We thanked our guide and drove back to Menton for a hearty supper.

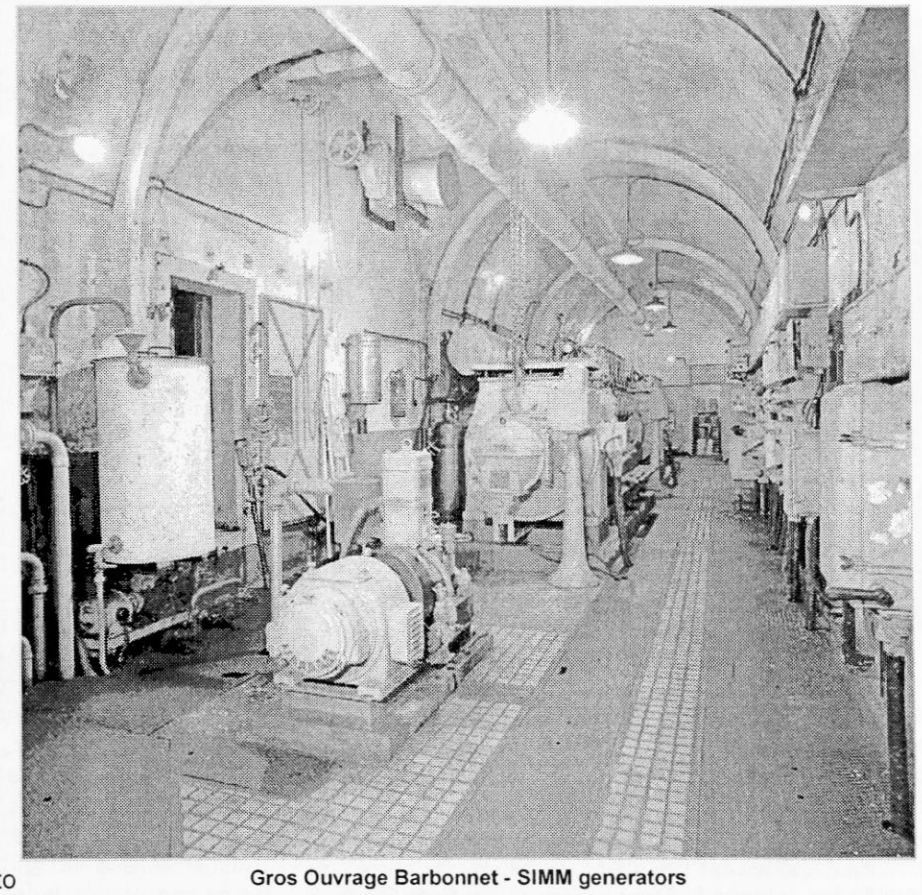
Day 3 - was bright and sunny. We had a pre arranged visit this day to LE BARBONNET. Before our arranged trip at 11am we had time to drive to the Italian border to look at the 'Avant' Post Pont St Louis on the French side of the Italian/French border. This acted as a look out point to report any impending invasion to the rest of the forts on the line and is only a single casemate built into the rock face overlooking the costal road. We were able to see the single embrasure and a typical Maginot style steel door in the rock face alongside. A little further up the road is the original Maginot road block gate which can be extended out across the road, from its protected enclosure. We drove a couple of miles into Italy to find somewhere to turn round but it was a good excuse to say we had been to another country.

On the way to Le Barbonnet we passed several disused sections of the Menton - Sospel narrow gauge tramway built to link the two towns in 1913. The most impressive section is an inclined viaduct looping round above the abyss below. The thousand yard tramway tunnel now forms one bore of a road tunnel on the new road into Sospel. We took the old road that winds high up into the mountains and took a detour to look at the Gros ouvrage of CASTILLION. The main entrance is immediately alongside a minor road. The men's entrance was welded shut and the drawbridge alongside was in the up position. Somebody had chipped away some concrete from the bottom of the drawbridge and a slimmer member

The Maginot Line in the Alps

of the party (Jason Blackiston) was able to squeeze through into the pit where the counter weight for the bridge was located. As time was pressing it was decided that a return visit was appropriate at a later date. We drove into Sospel, passed the Gros ouvrage of Saint Roche (a self guided museum) and up another long and winding road to Le Barbonnet
The original fort of Le Barbonnet stands on a mountain top overlooking Sospel.(2752 feet above sea level) It was built between 1883 and 1886 as part of the Séré de Rivières defences. The fort was renovated and rearmed in 1932 and in 1940 the Gros Ouverage of Le Barbonnet (with a linking tunnel to the old fort) was built at a slightly lower level alongside. The main fighting block (B2) is just below the ramparts of the original fort while the entrance, Block 1, is adjacent to the winding access road 80 feet below. The forts main claim to fame is the part it played in the Battle of the Alps in June 1940. It is still permanently occupied by the French army and there was a unit training during our visit. As a result we were not able to visit everywhere in the fort and photography was limited to exterior shots. The main armaments were 2 pairs of 155mm cannons mounted in hydraulically operated raising and rotating turrets known as 'Mougins'. They were installed in 1877 and weighed 150 tons each. Both turrets still remain in place although the guns from the southern Mougin have been removed. The northern turret, named 'Joan of Arc' is one of only two surviving complete examples in France. Between the two turrets there were 4 open emplacements but all the guns mounted in these have now been removed. Having walked over the top of the fort to see the turrets and the emplacements we descended into the narrow parade ground where we could see troops in class rooms under instruction. There is a small private museum which includes an intact German V1 rocket. We were able to see inside 'Joan of Arc' which is on three levels with an ammunition lift to the magazine below. There is a short internal tramway linking to the forts northern caponier. All the machinery is in excellent condition and well maintained by the society who look after the fort. Having toured the old fort we drove down to the 1940 Gros ouvrage. Although only consisting of two blocks, B1 the entrance and B2 the fighting block below the ramparts of the 1886 fort, this ouvrage housed 304 troops. Unlike St. Agnes which is open to the public daily in the Summer, Le Barbonnet is not a museum, it is still owned by the army and maintained by a preservation society. It is not open to the public but occasional visits can be arranged for interested parties.

The entrance blockhouse is on a hairpin bend with little parking available. The layout is fairly standard with all the forts we saw, once inside the entrance there is a long corridor with the generator room on the left and the filter room on the right. There are two marine diesel generators, compressors, compressed air tanks and racks of electrical switch gear, all in good working order. Beyond these on the right of the main corridor is the caserne with another well equipped work shop, water tanks, washing area, telephone exchange, the artillery commanders room with a floor standing telephone switchboard, situation boards and two telephone booths, infirmary, dormitories etc.



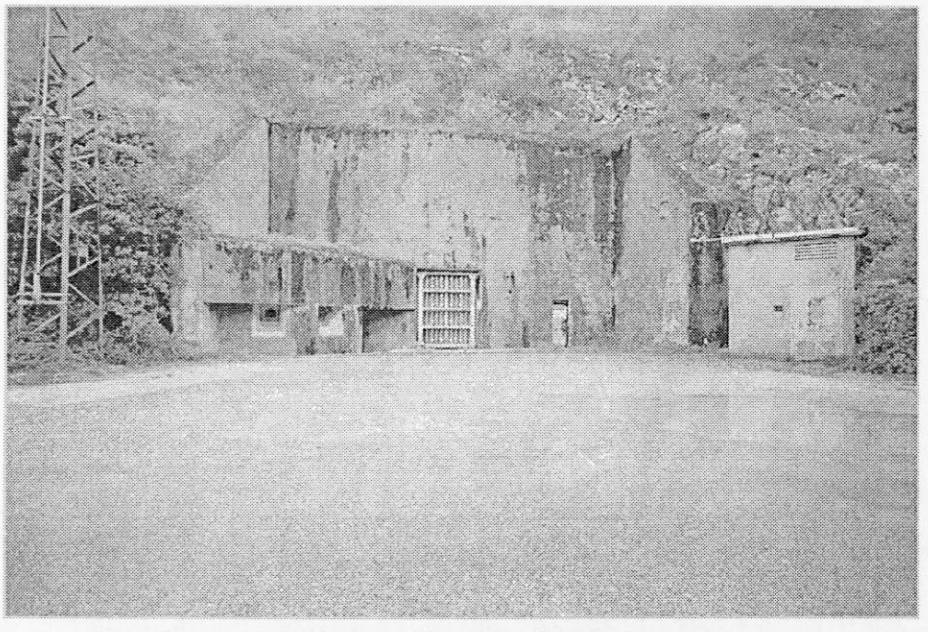
Gros Ouvrage Barbonnet - SIMM generators

At the end of the corridor stairs lead up to block 2 which has two upper levels. The lift was still in place but not working so we had to leg it 80' up the stairs. The lower level houses two 81mm mortars. The

The Maginot Line in the Alps

mortars are fixed at 45 degrees as they are shooting out of the fosse, but they can be moved from side to side. On the upper level there are two 75mm canons, one original and the other a recent replacement obtained from another fort. With the lack of manikins and interpretation boards found in many museums and a low lighting level using all the original electrical fittings Le Barbonnet gives a real flavour of what the fort must have been like when it was fully operational.

After a brief lunch break in Sospel it was back to CASTILLION to find out if it was possible to find a way inside for everyone. The two thinnest members of the party managed to squeeze underneath the drawbridge into the counterbalance pit and soon emerged on the opposite side of the bridge and



Gros Ouvrage of Castillon - Main Entrance

reported that it was welded closed so there would be no access at that Point. There next mission was to climb to the top of each of the 4 blocks in turn to see if the emergency escape hatch was open or operable. In most forts these hatches are secured with four latches on the inside and these latches can usually be released. They struck lucky with Block 3 the emergency escape hatch opened into the fosse which created a problem, how to get the other 15 explorers 12 foot down into the fosse. It wasn't to prove much of a problem however as we'd brought a 25' electron caving ladder, ropes and tackle to rig a safety line. The rest of us slowly made our way 150' up the rock face to Block 3 immediately above us. This was quickly achieved with some puffing and panting from the more portly members of the party.
A number of our party had never climbed an electron ladder before. Being made of stiff wire it's slightly easier to climb than a rope ladder and with Jason Blackiston looking after the safety line (he is a trained and experienced life liner) nobody had any problems. Once inside the block we split in to several parties allowing people to explore the fort at their own pace. Some people like to rush ahead and see everything others, like myself, like to take their time and take a lot of photographs which made it impossible to climb to the top of the four fighting blocks. As it was getting late in the day myself and Dan decided that we would concentrate on one block, the one we were in and then go down to the lower levels.
Castillion is a very compact gros ouvrage spreading over a surprisingly small area. The entrance, generator and caserne are at road level. From there steps lead up 100 feet to an intermediate level, from this level, further stairs rise up to the four fighting blocks. It was soon apparent that few people have entered this fort, the only graffiti is right at the entrance and there is no evidence of stripping, robbing or vandalism of any kind. Although completely derelict and abandoned the fort is in surprisingly good internal condition with many original features remaining.

It was clear from the outside that the guns were still in place as they were protruding through their embrasures, once inside Block 3 we found it was made up of two upper levels with a lift descending to the intermediate level 75' below us and a spiral staircase winding around the lift. On the upper level of the block the two 75 mm cannons are intact and in good condition and on the lower level we found two 81mm mortars fixed at 45 degrees. We descended to the intermediate level where there is a long corridor giving access to side corridors to the four fighting blocks. All the blocks have a lift and spiral staircase and a small magazine at this level. At the bottom of each block their is an airlock allowing any block to be sealed off from the rest of the fort. All the lift machinery is in good order. A single narrow gauge tramway runs along the corridor with a passing loop or station in the middle terminating at each of the four lifts where there is a turntable. There are also two turntables in the middle of the passing loop and a double lift down to the bottom level. Stairs down to this level are located away from the lift down a side corridor. This corridor also leads to the artillery commanders office, telephone exchange and other command offices. These retain their situation boards

The Maginot Line in the Alps

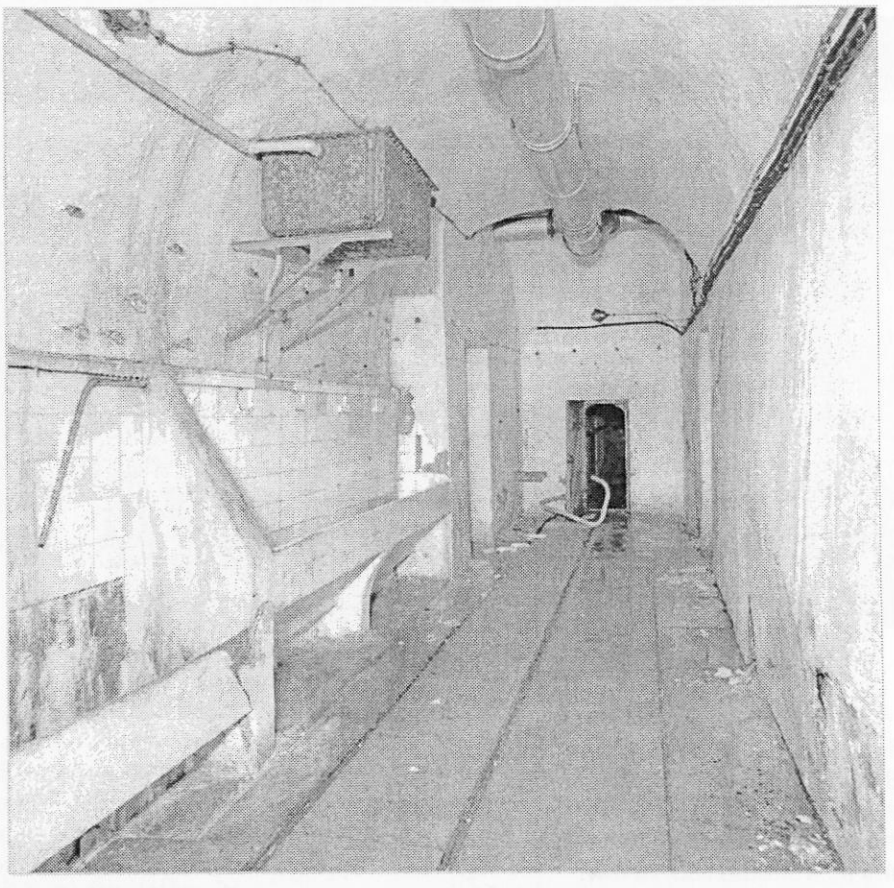
and telephone booths.

On the lower level is the caserne with dormitories and the infirmary. The dormitories are all empty as is the infirmary although it still retains its tiled walls, radiators and a small wash basin in each of the four rooms. One of the corridors in the caserne has washing facilities on either side with a water tank room at the end. The tanks are still full of water. From the caserne a short corridor leads out to Block 1 and the entrance drawbridge. Just before the block the kitchen is on the left. This still contains a large range with an extractor hood above it, a boiler, a line of sinks and a serving hatch into the corridor. Maginot forts did not have canteens, the men would collect their food from the kitchen and go back to the dormitory to eat. The forts operated a hot bed system with each bunk being used by three men, eight hours on duty, 8 hours resting and 8 hours sleeping. When fully manned the fort was home to 337 men. The final two rooms in the fort are opposite each other just before the corridor curves round through the entrance air lock. The filter room on the right with banks of carbon filters in cylinders along two walls. Opposite this is the generator room with two marine diesel generators, a compressor, fuel tanks and electrical switchgear all in good condition.

It was now getting on for 7pm so after a few quick photographs around the entrance area we returned to Block 3 and everyone climbed safely back up the electron ladder. Jason and Tony Page stayed inside and relocked the escape hatch from the inside finally emerging from the narrow hole under the drawbridge. We always like to leave a fort exactly as we found it. By now it was beginning to get dark so we hurried back to Menton for some well earned nosh.

Day four - dawned bright and sunny, we've certainly been lucky with the weather so far. The plan for the day was three derelict forts. No idea whether we'd be able to get inside any of them but we felt luck was with us.
The first fort was the Gros ouvrage of GORDOLON. The fort which housed 246 men is located close to the western bank of the River Vesubie at the end of a long dead end road off the D2565. As we approached the site the road became more overgrown and rutted and our way was eventually blocked by a land slide. We left the cars and continued on foot, after a further 200 yards reached the main entrance. The drawbridge was up but the men's entrance alongside was open. Again we split into several groups to allow the explorers to visit everything while the photographers went more slowly.

As with Castillion, Gordolon is on two levels with the entrance block, usine and caserne at road level with a stairway up to an intermediate corridor 60 feet above. At each end of this corridor further stairs lead to the two fighting blocks. The initial layout is similar to other forts we have visited, just inside the entrance there is a defended dog leg and beyond that an air lock into the main lower corridor. On the right is the filter room with two banks of carbon filter cylinders along each wall and ventilation trunking running from there into the rest of the tunnels. Opposite the filter room is the generator room. This time there are three marine diesel generators, some parts have been removed but they are generally in good condition. There is electrical switchgear along one wall and compressed air tanks for starting the generators. Back in the corridor the next room on the right is the

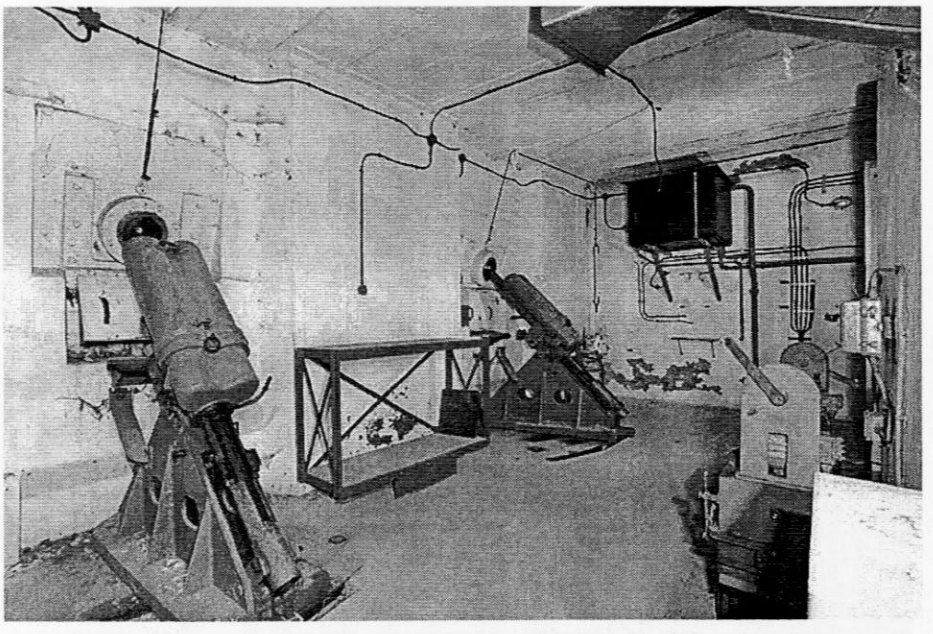


Gros Ouvrage of Gordolon - Wash Facilities

The Maginot Line in the Alps

kitchen. The range has gone but the extractor hood above it is still in place as are the sinks alongside. As usual there is a serving hatch into the corridor.

Beyond the kitchen there is a junction with the caserne straight ahead (all rooms empty) and the stairway to the intermediate corridor a short distance to the right. At the junction their is an original sign on the wall which reads 'Etage Superieur - PC Bloc 2, Bloc 3 Soutes' with an arrow pointing in that direction. There is a single lift with stairs winding around it and alongside it the lift motor room in good condition. The stairs to the fighting blocks are located at either end of the upper corridor and along a side passage is the artillery commanders office with other command officers alongside. All retain their individual



Gros Ouvrage of Flaut - 81mm Mortars Block 3

telephone booths. The guns are still in place in both fighting blocks. Block 3 has two 81mm mortars and Block 2 has two 81 mm mortars on the lower level and two 75mm canons on the upper level. Alongside the mortars in both blocks there are two ammunition lifts up from the floor below.

Our next fort was the Gros ouvrage of FLAUT located at the end of a long dead end road from the D2565. We were surprised to find two cars parked outside but this fort is slightly closer to civilisation with several public footpaths passing nearby. They turned out to be berry or mushroom pickers. There are five blocks in total at Flaut, the entrance and four fighting blocks. When fully manned the fort was home to 296 men. The men's entrance was again open so we moved quickly inside and as usual split into several groups. Some of the tunnels in the fort are quite long and unusually steeply graded which must have made it difficult for the men pushing the loaded ammunition wagons. It offered an opportunity for some of our party to go for a ride on one of the remaining wagons. Once inside the entrance airlock the first room on the right is the filter room with the usual banks of carbon filters on opposite walls. Opposite this is the generator room with three marine diesel generators, electrical switch gear, compressed air tanks and a compressor all still in place and in good condition. On the opposite side of the corridor is the kitchen which still retains its large range with an extractor hood above it. There is a compressor mounted at the back of the room but it is unclear why this was here, it's the only time we have seen one in the kitchen. Beyond the kitchen there is a junction with a long tunnel running off sharply to the left. At the end of the tunnel are Blocks 4 & 5 but as time as pressing we left these to the other explorers and carried on straight head towards the caserne and Block 3. The dormitories and the infirmary are empty but the command offices are in good condition retaining their situation boards and telephone booths. The telephone exchange is also well preserved. Us photographers only had time to visit Block 3 which is the largest block with twin 75 mm mortars still intact on the upper level of the two level block. Alongside them are two ammunition lifts from the floor below.

Our final visit for the day involved a long and arduous climb up to 6000 feet, some distance above the permanent tree line. The views at this height were absolutely outstanding but the road was not for the faintheartedness. In order to get to the Gros ouvrage of PLAN CAVAL we had to drive along a narrow circular one way road for several miles with sheer drops of many hundreds of feet on one side and no barriers of any kind. Eventually we made it to the top and parked our cars close to a collection of abandoned and ruined 19th century barrack blocks. These had nothing to do with the Maginot Line, but belonging to an earlier generation of fortifications.

Plan Caval is an unfinished Gros ouvrage with 6 blocks planned but only three built. These blocks were never finished and the fort was never armed. We entered through the emergency escape hatch in Block 4. Although this was located at the bottom of the fosse there was a large pile of stones making it easy to climb down. The small block is partially

The Maginot Line in the Alps

camouflaged as it's is clad in stone. It would have been only lightly armed with no heavy guns or mortars. A ladder alongside the lift shaft gives access to the corridor 20 feet below. Although the lift shaft with its gate has been constructed the lift and its associated machinery have never been installed. The passage is concrete lined and very clean. It is necessary to watch the floor carefully as there are a number of uncovered drains. After a short distance there is a crossroads, to the left is a collapsed or backfilled shaft to the surface and to the right a short passage leads to Blocks 5 & 6. There is a long tunnel straight ahead with a dog leg and a defensive embrasure in a room to one side. The passage continues for about 75 yards eventually opening out into a series of unlined tunnels running left and right. A number of these have wooden pit props and one of them is very heavily propped with vertical supports and cross timbers. A number of passages have collapsed but it's possible to climb over these collapses to reach a series of very high parallel tunnels, the possible location of the proposed caserne and usine areas. From here there was a tunnel to a blocked door, presumably the original planned entrance to Plan Caval. This was later located on the surface on a valley floor below the road. Having looked at the underground features we explored the surface. There is a Maginot block in the middle of the ruined barrack blocks but the turret and cloche were never fitted and the holes for them were later filled with concrete. There is a trench system on top of the hill with two small machine gun positions.

It was fascinating to see the various phases of construction of a Maginot Line Fort. It is unclear why work on this fort started so late but it is recorded that construction stopped in 1940 because of the war.

From Plan Caval we drove back across country to Menton where we all dined together at a posh restaurant.

On Day 5 - after another less than hearty breakfast we piled into the cars. We didn't have to be at the airport till 5 so there was still time to visit two more forts, one derelict and one preserved. Our first port of call was to the Gros ouvrage of MONTE GROSSO, an unusually large fort for the Alpine sector more reminiscent of those we were used to at Thionville. The fort which had 7 blocks and 363 men is located at the end of a long dead end road 4 km north of Sospel. Luck was on our side again. Initially it appeared that we wouldn't be able to get in as the drawbridge was up. Although a large hole had been cut in the door of the men's entrance the second door beyond it was welded shut. There was however a small hole and our thinnest member, Jason Blackiston, was able to squeeze through and into the fort. He released the locks on the drawbridge and the rest of us were able to pull it down with a rope. Everyone entered the fort.

It was quickly apparent that this wasn't a clean and undamaged fort like all those visited earlier in the

Gros Ouvrage of Flaut - Unfinished Gallery

week. The walls were covered with soot and everywhere we went there was evidence of wiring being stripped out. There appeared to be no actual fire damage anywhere so it can only be assumed that the insulation was burnt off the wiring underground which must have been very unpleasant for those doing it. This is one of the few forts in the region with raising and rotating turrets so as time was pressing the photographic party of myself and Dan made first for Block 6 which contained twin 135mm guns within its turret. To our surprise the scrap men hadn't

The Maginot Line in the Alps

reached that far and the turret and it's guns were intact and in excellent condition.

The block is on two levels with the counter balance weight and winding gear on the lower level and the turret itself on the upper level. Although the electric motors and control equipment have been removed were still able to raise and rotate the turret by hand after 50 years of disuse. Block 5 also retains its 75mm turret and guns.

Although the lower levels have been badly vandalised and stripped of any wiring the caserne was in surprisingly good conditions. Most of the dormitories retain their bed frames and printed names on many of the doors stating which ranks were in which rooms. There were several other original wall signs at the entrance to the caserne and infermarie and one door off the main corridor was labelled 'Chambre des adjudants de Genie'. The generator room is a disappointment. It is the biggest we had seen with four large marine diesel generators but they have all been partially stripped with parts lying all over the floor. The room was a mess.

Our final fort was the Gros ouvrage of L'AGAISEN 4 km north of Sospel. In complete contrast to Monte Grosso the fort is in superb internal condition. It still belongs to the army and is maintained by the same society that look after Le Barbonnet. For once we had an English speaking guide who described our tour of the fort as going back into the 1940's and like Le Barbonnet it certainly had that feel about it.
Our guide explained that because of the recent bad weather the fort was damp and they were unable to run all the lighting. He was pleased that didn't seem to worry anyone. Once inside the fort we could hear an engine running, as we passed the generator room he explained it was the compressor charging up a compressed air cylinder. He said he hoped there would be enough air to start one of the generators on our way back.

The kitchen and caserne with its dormitories, infirmary and commanders offices are all in excellent original condition as are the two fighting blocks that we entered, Blocks 3 and 2. The lifts to the two blocks are still in good order although we weren't able to use them as the they are only safe to move equipment up and down. Luckily it was only about 50 feet up the stairs. Block 2 is armed with two 75 mm cannons and two 81 mm mortars while Block 3 has a 75mm turret. Unlike the turrets at Monte Grosso this one is in near pristine condition with all of its control equipment still intact. It is currently being restored by the Society.

On our way back to the entrance we called back at the generator room and our guide told us he didn't think there was enough air in the tank but he'd have a go at starting one of the generators. To his surprise it quickly sprung into life and we soon felt the rush of cool air blowing through the ventilation system. Unfortunately this was short lived. After a few minutes sparks started coming out of the alternator, there was a loud band and everything ground to a halt. Our guide didn't seem too perturbed explaining that there was probably no serious damage. The generator was very damp and would need time to dry out.
Our guide explained that the Association that maintains the fort has 400 members but only 10 of them ever do any work (a familiar story) so restoration at the fort proceeds very slowly with working parties one day a month. We offered to send a team over from Sub Brit next year and this was gratefully received.

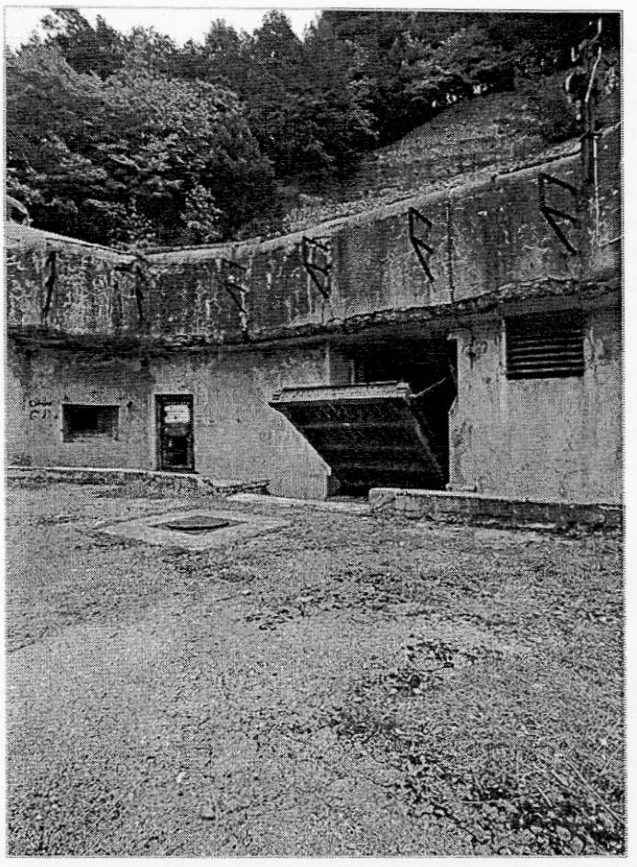
It was now mid afternoon and time to bring our Alpine visit to a close. We drove in sombre convoy back to Nice Airport, left our cars with the car hire company (I hope they didn't notice the new dent that had appeared in one of them), we though it wise not to tell them the kind of roads we'd been driving on, many of them hadn't seen tarmac or concrete for many years.
My thanks to Dan McKenzie for organising a superb trip that went virtually without a hitch. We got into a lot more than I had expected and generally what we saw of the derelict forts was preserved in surprisingly good condition. At £370 a head for 5 days this is one of our more expensive excursions but bear in mind a professionally organised bunker tour (of which there are several) would probably have cost a lot more than double that amount and we would probably have seen half of what we saw with Dan. I thought £370 was superb value for money.

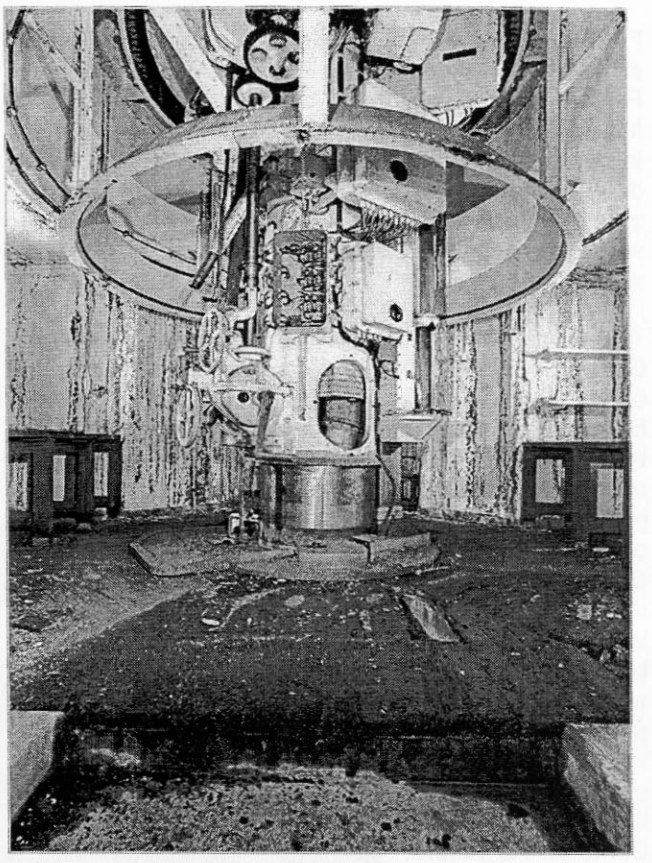
Those attending were Nick Catford, Dan McKenzie, Robin Ware, Tony Page, Mark Bennett, Jason Blackiston, Jason Green, John Burgess, Ian Walker, Stewart Wild, David Ferris, Mike Barton, Peter Walker, Richard Challis, Bob Clary, Clayton Donnell and Cris Subrezi.

By Nick Catford

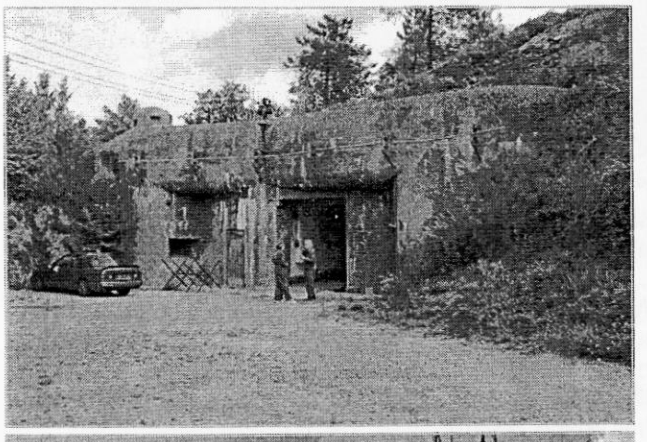
More Photos can be found on Dan McKenzie's Web site at http://www.bunkertours.com

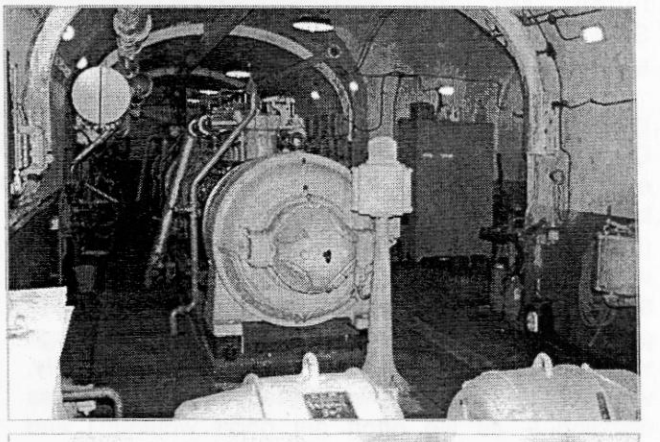
The Maginot Line in the Alps

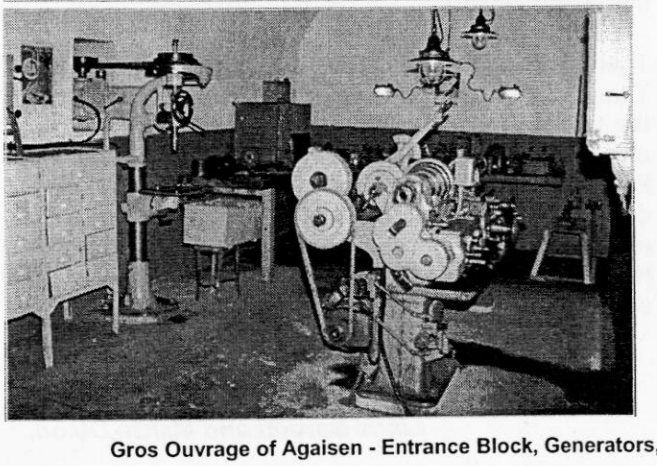


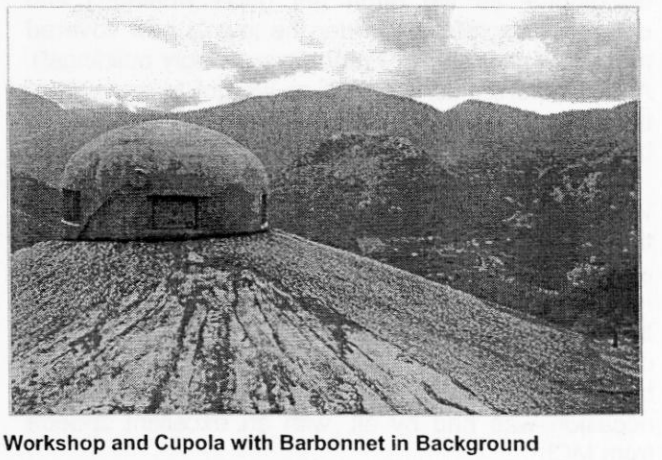


Gros Ouvrage of Mont Grosso - Main entrance and 135mm Turret







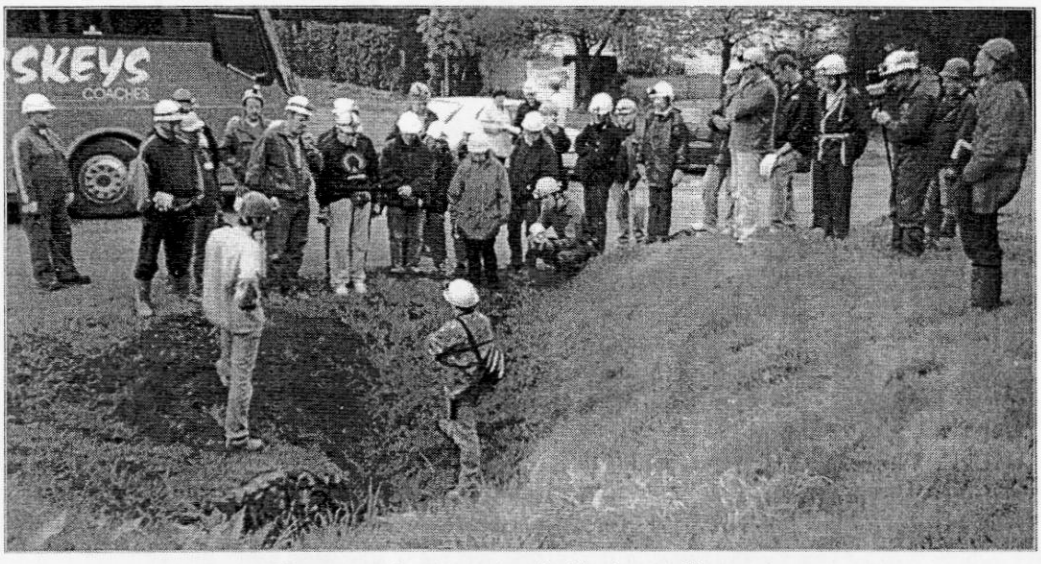


Gros Ouvrage of Agaisen - Entrance Block, Generators, Workshop and Cupola with Barbonnet in Background

'Les Souterrains de France' – Sub Brit's Trip to France May 2002

For the fourth year running, a number of us ventured abroad for a weekend underground in the North of France. On Saturday 11th May, 34 of us met at the horribly early (for a Saturday morning!) hour of 08:00, to board the coach at Ashford Railway station, with old friends and new arriving by car and train. We had a smooth crossing via the Channel Tunnel and were soon whizzing into the centre of Calais for our first visit of the day.

The Calais museum of the war is housed in an old German bunker, bizarrely set in a park in the middle of Calais, adjacent to the wonderful statue of the Burghers of Calais and the huge Town Hall. The bunker was built as a Naval Command Centre, its about 100 metres long and has 20 rooms, and is now packed with all sorts of artefacts and displays, including some on the Atlantic Wall and the V-bomb sites, which we have visited in previous years. Time for a quick coffee, and then back on the coach to travel to Cambrai. As before, we brought a picnic lunch for the Saturday – so we soon tucked in.



The group about to enter the Muches at Hiermont

We visited 2 sites in Cambrai, both excellently guided by local people from the tourist office, mostly in English (but with Stewart and David as brilliant translators when we needed them). Firstly, an extensive trip through the extraordinarily complex underground passages of the 16th century Citadel, although virtually nothing remains on the surface. Secondly, we walked across town (disappointingly, it was drizzling – as we often get good weather!) and entered a secret door under the town's new covered market (surely one of France's most ugly buildings!). A very different sort of visit, as we got to see part of the city's extensive limestone quarries – each building was built from stone extracted beneath it!.

We stayed overnight in Arras – we've stayed there the previous 2 years, but were somewhat taken aback to find the lovely old square filled with 790 Honda Goldwing motorbikes. Actually they had been there all day for a rally, but were gradually moving out, leaving the bars a bit freer for us to enjoy a beer, before we dined underground in La Rapiere – a joyful occasion was had by all, with an excellent speech from MC!

An early start on Sunday (not too many hangovers!) to visit the Picardy Muches – these are small underground refuges under the towns of northern France – quite unique to this area. At Hiermont, we were greeted by the Lady Mayor and met up with Fred Willman and his colleagues, who are a local underground group who specifically study the Muches (see their website www.muches.fr.st). Our guides, Fred and Hugues spoke on them at the last Cambridge day conference. The entrance to Hiermont slopes down gently under the church, and reveals 2 streets of Muches, each with 'houses' either side, some double rooms with one room dedicated to animals, carved out of the limestone. They were used in times of trouble – notably the Franco Spanish wars in 16C and 17C. Villagers would dive underground for short periods when trouble loomed. The refuges were also used in the First and Second world wars.

A Gastronomic lunch at a regional restaurant nearby and then our 2nd Muche at Domqueurs, again escorted by Fred and his chums. And, hey presto – the weather was gloriously sunny as we relaxed in the village square.

Then back on the coach for the journey back to the Tunnel – quite a lot of snoring, as people dozed after the hectic weekend. During the journey, we got our arms twisted to run another trip in 2003 – see the Flyer enclosed – so many thanks to all of you who came along and enjoyed it so much – we certainly enjoyed arranging the trip and getting to see some really excellent French sites. We look forward to seeing many of you in May 2003.

Linda Bartlett and Martin Dixon.